THE
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ELECTRO-PLATERS REVIEW

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Electroplaters' Meeting in Detroit, Mich.

A Report of the Seventeenth Annual Convention of the American Electroplaters' Society. All Officers Reelected. Next Convention in Washington, D. C.

By F. J. HUNTLEY
Detroit, Mich.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

All Officers Reelected

HORACE H. SMITH, of Newark, N. J., was re-elected president of the American Electroplaters' Society at the seventeenth annual convention held at the Statler Hotel in Detroit, Mich., from July 8 to July 11.

All the other officers also were reelected, consisting of C. E. Van Derau, Mansfield, O., first vice president; William J. R. Kennedy, Springfield, Mass., second vice president; George Gehling, Philadelphia, Pa., secretary-treasurer; F. J. Hanlon, Chicago, Ill., editor of The Monthly Review. With John H. Feeley, of Montreal, Que., past president, the foregoing officers constitute the new executive board.

1930 Convention in Washington, D. C.

Washington, D. C., was chosen as the 1930 convention city.

Prizes for Papers and Exhibits

First prize for the best paper went to F. C. Mesle, past president; second to the Newark Branch for its experimental work during the year, under O. J. Sizelove; third, Harold Work, Pittsburgh; honorable mention, Jacob Paine and B. J. Lewis.

Founders' Gold Medal was also awarded to F. C. Mesle.

For the best individual exhibit of work: first prize, F. Weber, St. Louis, Mo.; second, George Ramm, Detroit; third, J. B. Bernardo, Philadelphia, Pa.; honor-

Re-Elected Officers of the American Electroplaters' Society

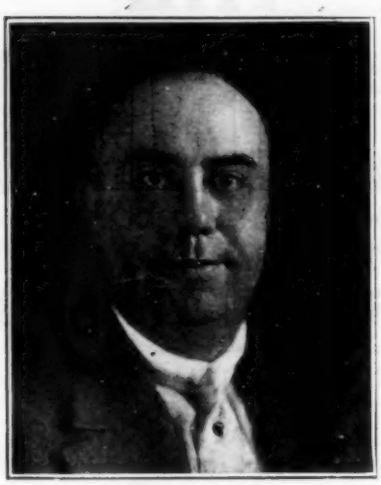
HORACE H. SMITH
Newark Branch
President

C. A. VAN DERAU
Dayton Branch
First Vice-President

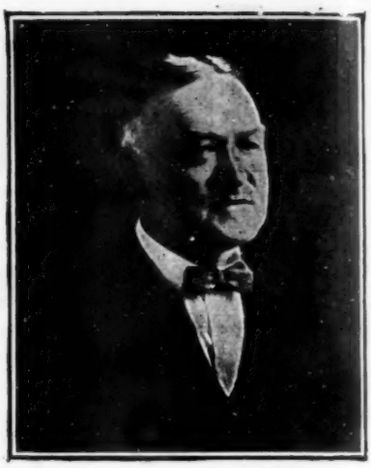
W. J. R. KENNEDY
Hartford, Conn., Valley Branch
Second Vice-President

Re-Elected Officers of the American Electroplaters' Society

GEORGE GEHLING
Philadelphia Branch
Secretary-Treasurer



F. J. HANLON
Chicago Branch
Editor, The Monthly Review



J. H. FEELEY
Montreal Branch
Past President

able mention, E. Hail, Detroit, Mich., Oscar E. Servis, Chicago, Ill.

Business and Technical Sessions

Mr. Gehling, secretary-treasurer, was commended for his capable and effective administration as were the other officers and committee heads.

Action was taken towards cooperation with the platers of the British Isles with regard to standardization of platers' terms, which, it is believed, will be a means of clarifying the platers' language, on both sides of the Atlantic.

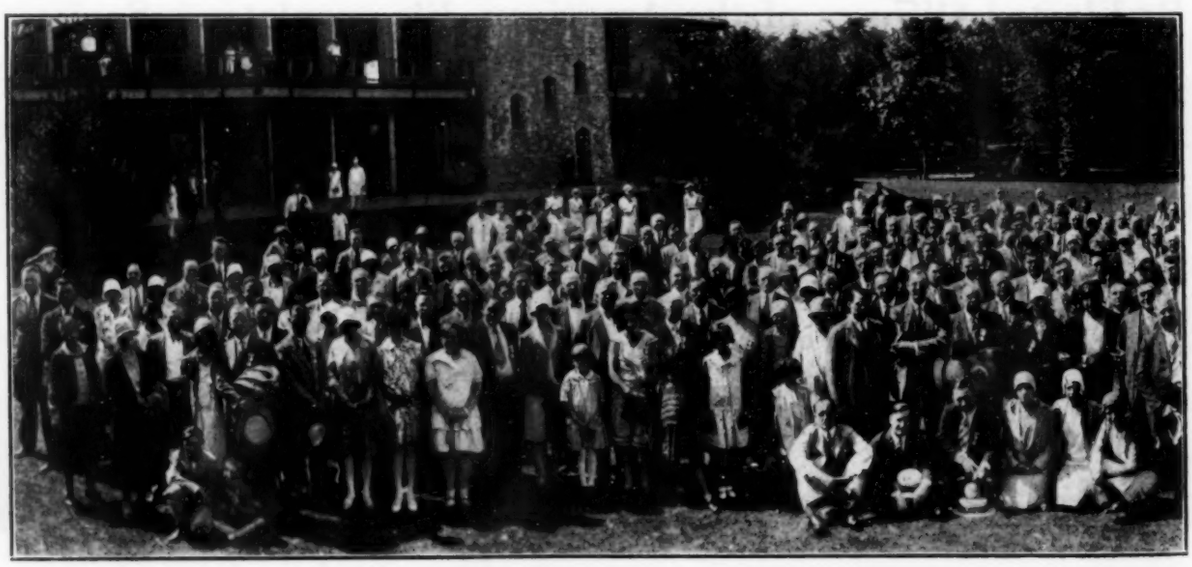
Chromium plating, as might be expected, was the center of interest, of both papers and discussions. Hardly a paper was read that did not have something to say about this process.

The opening session started promptly at 1:30 p. m. with an address of welcome by E. G. Lovering, of Detroit, consulting plating engineer and chairman of the convention committee, in which he expressed his pleasure in finding so many present from every part of the United States and Canada and even from the British Isles. T. C. Eichstaedt, of Detroit, designer of the badge that served as a credential to the convention hall, also appeared on the platform and was greeted with an ovation. Mr. Eichstaedt is known wherever plating is an industry.

George A. Walters, Detroit alderman was a personal representative of Mayor John Lodge. He informed the visitors they could have a free run of the city for as long as they desired.

T. C. Eichstadt who introduced Mr. Walters then followed by announcing Supreme President Horace H. Smith, of Newark, N. J. The convention then was in full swing with a lead off by Charles H. Proctor, founder of the Society who spoke on "Looking Forward in the Electroplating Industry."

The Monday evening session was opened with a paper on "Scientific Plating Control," by L. C. Turnock, of the Turnock Engineering Company, Cleveland, O. A. L. Matthes, of the Westinghouse Electric & Manufacturing Company, then discussed "Wage Incentives," saying that:



The Electroplaters and their Guests Went to Bob-Lo for an Outing

"Researches conducted by technical engineers have revealed the advantages of bonus systems installed in operating departments. Wage incentives are believed by many to be responsible for increases in efficiency in various lines of production.

"Since the electroplating of an article may be classified as a production operation, it seems likely that the bonus system would here apply. As a matter of fact, several of the larger electroplating plants are using this plan with good results.

"A plating plant operating under these conditions has its personnel divided into groups, which are under the supervision of foremen. Efficient time study methods fix the amount of work to be finished daily by each group under average conditions. The group units complete this specified material and are paid accordingly. However, should the group finish more than the required amount, they are paid a bonus in proportion to the excess of their quota.

"It may be seen, therefore, that by this method a wage incentive is placed before the men to spur them on to increased efforts. Greater quantities are apt to be produced with greater efficiency, due to the fact that the men are placed on their own. They have the feeling that they are working, more or less, for themselves; a feeling which inevitably results in better all around production and quality."

The Badge Worn by the Delegates to the Convention. The Small Button on the Ribbon Was Also Used. These Were Designed by the Detroit Branch Committee and Were Very Favorably Received

F. C. Mesle, Who Was Awarded First Prize and the Founder's Gold Medal for the Best Paper of the Year

J. M. Carmody, also spoke admirably on "Executive Foremanship." He was followed by Dr. A. K. Graham with a paper on "Industrial Cleaning of Metals," which also was highly commended. A question box brought the session to a close.

The convention hall was crowded on Tuesday morning, as many additional delegates had arrived. George B. Hogaboom started the session with a fine paper on "Brass Plating." Then followed another from T. P. Thomas on "The Electrodeposition of Iron," also highly praised.

L. R. Westbrook lucidly discussed "Electroplating of Cadmium from Cyanide Baths."

"For commercial operation it is desirable to have a plating bath that will function to give a satisfactory deposit with maximum uniformity and efficiency under a wide variation in operating conditions. This involves high conductivity and throwing power, with ability to produce a bright and satisfactory plate over a wide range of cathode current densities at high efficiency. Also the bath should be self-sustaining and not subject to appreciable variations in composition due to continued use.

"The concentration of this compound is essentially the cadmium concentration and will be so regarded. For general purposes and high efficiences it should be around 5.4 oz. of cadmium per gal. Variations in the cadmium content of a bath necessarily include

About 700 People Attended. Among Other Things, They Saw a Baseball Game, West vs. East

variations in the concentrations of other constituents to maintain a proper balance.

"The essential requirements for maintaining the cadmium concentration of the baths are to:

"(1) Provide plenty of cadmium anode surface, which should be at least equal to the cathode surface, and preferably twice as great, so as to keep the anode current densities low, preferably below 20 amp. per sq. ft.

"(2) Avoid the use of inert anodes, which cuts down on the amount of current available for putting cadmium into solution, and in addition causes excessive destruction of the free cyanide content by oxidation to sodium carbonate, and

"(3) Provide plenty of free cyanide.

"An extensive plating experience shows that Sodium Cyanide as free cyanide, sodium hydroxide, sodium sulphate and sodium carbonate, are all factors which must be carefully considered by the plater. Brighteners, when used in the plating baths in very small amounts, have marked and highly desirable influences on the physical characteristics of cadmium, producing a brighter and smoother deposit.

"In summing up, the common metallic elements may be grouped into three classes according to the effects produced by the presence of a small amount as impurity in baths composed of pure chemicals. Tests were made on such baths with or without various organic addition agents and in the presence and absence of nickel as a brightener."

Another praiseworthy paper was that from H. C. Pierce on "Cadmium Plating." This paper is reprinted on page 373 of this issue.

The final paper of the Tuesday morning session was from George P. Dubpernell, who made "A Report on the Possibilities of Poisoning from Cadmium Plate." (See page 372 of this issue).

Fine papers were read at the Tuesday afternoon session. There was one on "Chromium Plating Factors" by Oliver J. Sizelove; another on "Some Causes of Resistance in Chromium Plating Solutions," by Prof. D. T. Ewing. He was followed by Walter W. Rowe, who spoke on "Mechanics of Chromium Plating." "Some Observations on the Corrosion of Chromium Deposits," also was an interesting paper read by Cleveland Nixon. Prof. F. C. Mathers ably discussed "Conditions that Cause Changes in the Composition of Plating Baths and Possible Remedies." The usual question box followed.

The Tuesday evening session brought a summary of researches on electroplating from Dr. W. Blum, of the U. S. Bureau of Standards.

W. P. Barrows also gave a report on spotting out of plated metals. He was followed by another report on Throwing Power in Chromium Plating by H. L. Farber.

Reports from the Research Committee also were made by R. J. O'Connor and P. Sievering.

This session was similar to one held in Newark, N. J., by the Research Committee on April 6, 1929. For a complete report see THE METAL INDUSTRY for May, 1929, pages 220-223.

The final educational session came on Wednesday morning. At that time C. A. Van Derau discussed "Material Costs of Various Finishes," which was decidedly interesting. Donald Wood followed with a paper on "The Measurement of Chlorides in Nickel Plating Solutions." W. M. Phillips captioned his talk with "A Warning."

Oscar E. Servis, Who Received Honorable Mention for His Exhibit of Plated and Finished Work

Milford H. Corbin followed with a decidedly interesting lecture on "Electrodeposition of Non-Metallic Materials," during which he made demonstrations. (See page 371 of this issue).

Recreation and Entertainment

Wednesday afternoon was given over to play. There was a trip down the Detroit river to Bois Blanc Island where there were ball games, dancing and plenty of good things to eat. Cyanide Bill Schneider's Old Timers beat Ed Lovering's Veterans, and in the Annual Classic, the West defeated the East by a large score. There was no evening session.

Thursday morning was devoted to the business meeting at which reports of committees were read, officers elected and other routine business transacted. The afternoon was devoted to visiting plants about the city.

Everybody Had a Good Time. Bob-Lo Is in Canada, Not Far from Detroit

The convention came to a close on Thursday evening with banquet and dance at which about 650 were present.

One of the highlights of the convention was an early adjournment on Monday afternoon for a visit to the airport and airplane plant of the Ford Motor Company. Many of the delegates were taken into the air for a trip over the city of Detroit and the cities on the Canadian side of the river.

Nearly 700 delegates and visitors were registered, 125 being ladies. The latter were not at the sessions but put in their time on shopping expeditions, theatre parties and motor trips about the city.

In Memoriam

Since the last convention a number of members have passed away. At one of the opening sessions their names were read and a tribute paid to their memory. They are as follows:

Chicago Branch—C. A. Barne, W. L. Lotts, Walter Brutzen, J. T. Satka, H. H. Posbeck.

Philadelphia Branch—John A. Gottsman, C. F. Harbster.

Newark Branch—H. W. Young.

Providence—Attleboro Branch—Alfred Goethe.

Hartford—Connecticut Valley Branch—J. A. Bagshaw.

Montreal Branch—John Ainstie.

Pittsburgh Branch—J. L. Jones.

Detroit Branch—Charles Cequin.

Bridgeport Branch—Geo. J. Bell.

Exhibits of Plating

The following had exhibits of work that was inspected and commended by every one attending the convention:

DeLong Hookeye Company, Philadelphia; Speakman Company, Wilmington, Del.; Evaco Industries, Detroit; A. H. Wirz, Inc., Chester, Pa.; Eureka, Vacuum Cleaner Company, Detroit; Bohn Aluminum & Brass Corporation, Detroit; Graham Paige Company, plating department, Detroit; Baltimore Copper Mills, Baltimore; Nicholl Chromium Company, Detroit; Zeeland Ornamental Company, Zeeland, Mich.; McCord Radiator Company, Detroit; Felt, Farrant Manufacturing Company, Chicago; S. & M. Lamp Company, Palace Plating Works, De Luxe Plating & Manufacturing Company and the Harvey Machine Company, Los Angeles; Edison Electric Appliance Company, Ontario, Calif.; Zourin Drawn Metals Company, Chicago Heights.

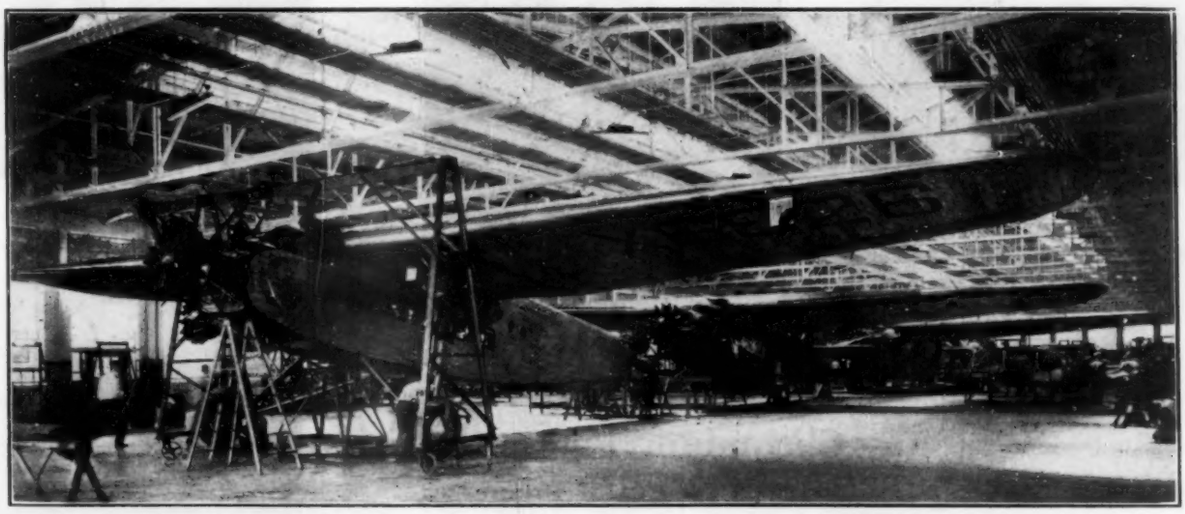
E. V. Allen, manager of the Evaco Industries, 1329-31 East Vernor Highway, Detroit, kept open house all through the convention. Many delegates and other visitors were recipients of his hospitality when they called to inspect his plant.

Members of the Detroit branch are responsible for the wonderful entertainment accorded to every one, whether delegates or visitors. They gave over the entire week to the convention and personally did everything possible to assist in making the gathering one that long will be remembered.

Railroad Certificates

Of the seven hundred members and guests who registered at the convention, only one hundred and twenty-five turned in railroad certificates. Consequently it was impossible to obtain the reduced fare for the return trip, as the minimum required was 150. This omission on the part of only twenty-five members cost the Society hundreds of dollars. While it is understandable that this oversight occurred because the situation arose for the first time, it is a great pity that such an opportunity was allowed to slip.

Full publicity will be given to the railroad fare reduction for the next convention and it is hoped that all members will take advantage of it.



Interior, Ford Airplane Factory. A Center of Interest to Delegates and Visitors to the Electroplaters' Convention

International Fellowship Club

The International Fellowship Club held a Luncheon at the Statler Hotel in Detroit, July 9th, which turned out to be one of the best in the history of the Club. It was voted by those who attended to be one of the outstanding features of the convention of the American Electroplaters' Society. There were fifty-six manufacturers and sales representatives present at the Luncheon.

Frank J. Clark, International Chairman, acted as toastmaster. After luncheon had been served, Mr. Clark introduced Dr. Blum who spoke on Research in Electroplating Processes. This talk was followed by A. P. Munning who spoke on the Application of Research Results to Commercial Practice. The third speaker was W. S. McKeon, one of the founders of the Club, who told of his interesting experiences in flying from Pittsburgh to Detroit.

The speeches were followed by the election of the following officers for the coming year:

Chairman, Benjamin Popper. Egyptian Lacquer Manufacturing Company, New York.

Vice-Chairman, G. Cannon, Matchless Metal Polish Company of Chicago.

Secretary, T. A. Trumbour, The Metal Industry and the Brass World, New York.

The new officers were installed by W. S. McKeon.

The outgoing officers were highly commended for their work during the past year in arousing so must interest in the Club. The new officers have a high standard set for them.

The next Luncheon of the Club will be held in Chicago. Announcement of the date and place will be made in the Metal Industry in an early issue.

The strength of the Club has vindicated the adoption of the code of ethics which was set up when the Club was founded. This code has the possibility of doing so much good for the industry that we reprint it in full below. It is urged as a guide to salesmen of electroplating equipment and supplies.

1. To be guided by the laws of honor and to compete with fairness and honesty.
2. To refrain from false references to competitors and their products or the circulation of harmful rumors concerning them.
3. To strive for a better knowledge of materials and processes so as more efficiently to advise his customers.
4. To promote the welfare of the industry.
5. To remember that information gained in the line of business is privileged and inviolable, not to be revealed except with full consent.
6. To assure the buyer full co-operation and the use of as limited amount of his time as the subject at issue will permit.
7. To co-operate in every way with those engaged in activities which will aid and improve the industry and to work with our competitors in all lawful ways to increase the efficiency and service to the industry as a whole.
8. To actively support the Federal Trade Commission in locating and prosecuting individuals guilty of improper practice.
9. To respect all obligations and to require that obligations to us and our companies be respected.
10. To adhere faithfully to the rules of conduct herein set forth, recognizing that a simple guide to right action is found in the practice of the Golden Rule.

New Officers of the International Fellowship Club

BENJAMIN POPPER
Egyptian Lacquer Manufacturing Company, New York
Chairman

G. CANNON
Matchless Metal Polish Company, Chicago, Ill.
Vice-Chairman

T. A. TRUMBOUR
The Metal Industry and the Brass World, New York
Secretary

Chromium Patent Decision

According to reports from abroad, a decision has been given by the Annulment Committee of the German Patent Office, which, on March 21st last, at the instance of the firm of Erich Kruppa, Chromium Plating Works, Markranstadt, annulled the German Patent No. 448,526, of July 22, 1924, which had been claimed to be one of the most important of all the patents relating to chromium plating. The title of the patent is "Process for Making Suitable Solution for the Electrolytic Deposition of Metallic Chromium", and the claims made were the following:

(a) Process for making suitable solution for deposition of metallic chromium, characterized by using chromic acid with not more than 1.2% contents of free foreign (other) acid, reckoned in proportion to the amount of chromic acid—anhydrides being reduced cathodically in a solution with water, and (b) Process as (a), etc.

The users of the patent were the members of the Chrom. Interessen Gemeinschaft (C. I. G.). The holders of the patent will, it is understood, appeal to the Federal Court.

THE METAL INDUSTRY is advised, on good authority, that this patent has no counterpart in the United States. This prevents any decision with reference to it from creating a precedent, as far as the patent situation in the United States is concerned. For this reason, many in this country and in Europe have not laid much stress on this particular decision which, indeed, is not final.

Our Increased Plating Staff

We wish to announce an important increase in the staff of Associate Editors of THE METAL INDUSTRY. It is with genuine pleasure that we list the following accessions to our group of experts who will aid us in solving our readers' shop problems:

William Blum, Ph.D., Chief of the Division of Electrochemistry, Bureau of Standards, Washington, D. C.

Walter Fraine, National Cash Register Company, Dayton, Ohio.

A. K. Graham, Ph.D., University of Pennsylvania, Philadelphia.

George B. Hogaboom, Hanson Van Winkle-Munning Company, Matawan, N. J.

Oliver J. Sizelove, August Goertz and Company, Newark, N. J.

We feel that our shop problem department has been greatly strengthened. We now have experts in each of the various specialties of electroplating, which has grown to be too large a field for one man to take care of without aid.

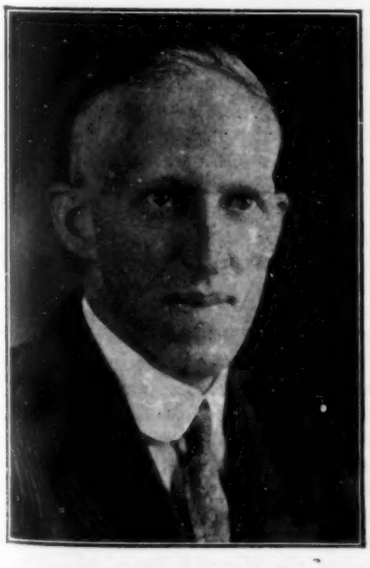
Charles H. Proctor, who has handled this work for us so capably for many years, has retired from our organization to take up other interests.

Mr. Sizelove has been acting as one of our associate editors for about a year and our readers are, therefore, familiar with his work. The others need no introduction as they are nationally known and respected for their ability and standing in the industry, and their unselfish devotion to the best interests of electroplating. We give below a brief record of their professional careers.

William Blum

William Blum, Ph.D., Chief of the Division of Electrochemistry of the Bureau of Standards in Washington, D. C., was born in Philadelphia in 1881. He graduated from the Central High School, Philadelphia, in 1899, and received the degree of B.S. from the University of Pennsylvania in 1903. In 1908 he received the degree of Ph.D. from the same University. From 1903 to 1909 he was instructor and then assistant professor of chemistry at the University of Utah. Since 1909 he has been a chemist at the Bureau of Standards, engaged first in researches on analytical methods. For the past fifteen years, however, he has been in charge of studies on electrodeposition with special reference to the electroplating and electrotyping industries.

Dr. Blum has published many papers on electrodeposition in the Transactions of the American Electrochemical Society, the American Electroplaters' Society and the American Chemical Society; also the technical press. He is the joint author of the book Principles of Electroplating and Electroforming by W. Blum and G. B. Hogaboom. He is a member of the Cosmos Club and the Chemists' Club, and in June 1926 he was awarded the first medal of the American Institute of Chemists for his studies and contributions in the electrochemical field. He is a past president of the American Electrochemical Society.



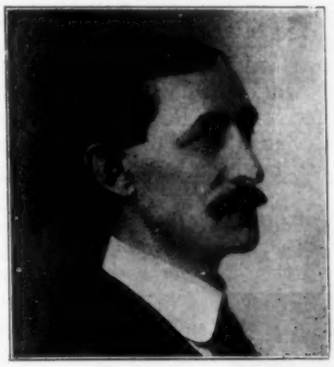
William Blum, Ph. D.

Dr. Blum is known throughout the United States for his untiring efforts to improve the electroplating industry, and to change electroplating from an art to a science. He is mainly responsible for the adoption by the plating industry of solution control by analysis and for its adoption of methods of measuring hydrogen ion concentration or judging the of pH, polarization and throwing power.

Walter Fraine

Walter Fraine was born in Newark, N. J., Feb. 27th, 1868. He entered the plating industry at the Waterbury Button Company, Waterbury, Connecticut, in 1890. He spent eleven years with this concern, seven years of which were spent principally on gold and silver.

He had his first foremanship with the Blake Manufacturing Company, Springfield, Massachusetts, working in novelties and small metal goods; three years as foreman with this Company. He spent three years with the Connecticut Web Company, Bridgeport, Connecticut, in charge of their plating department, and two years with the Bridgeport Gun Implement Company on arms, sporting goods, and bicycle equipment, in charge of polishing, plating and finishing.



Walter Fraine

Mr. Fraine was four years with the Columbia Fastener Company, New York City, in charge of plating and finishing; one year with the La Peer Manufacturing Company, jewelers and silversmiths, Newark, N. J.; one year with the Unger Brothers Company, silversmiths, also in Newark, N. J.; four years with the August Goertz Company, Newark, N. J., on metal novelties and bag frames.

Mr. Fraine come to the National Cash Register Company, Dayton, Ohio, in 1903. He is still with that company, in charge of all plating and metal finishing work.

Mr. Fraine is a charter member of Dayton Branch, since 1913. He was its first president, serving for eight consecutive years. He has been a member of the Supreme Society since 1914; secretary of Supreme Society three years, 1914 to 1917; President, Supreme Society, 1918 to 1919. He was awarded the Founders Gold Medal in 1925, first time it was awarded.

A. K. Graham

Dr. A. K. Graham is in charge of chemical engineering at the University of Pennsylvania, Philadelphia. He is engaged in teaching, doing research work and consulting work. Dr. Graham has been prominent in the electroplating field for a number of years. He graduated in chemical engineering from the University of Pennsylvania in 1919. In 1923 he received the degree of chemical engineer, in 1924 the degree of Master of Science, and in 1927 the degree of Doctor of Philosophy. He gained his early experience with such companies as the Scovill Manufacturing Company, Waterbury, Conn., and the Welsbach Company,

A. K. Graham, Ph. D.

Gloucester, N. J. For several years he was in charge of the chemistry class of the Philadelphia Branch of the American Electroplaters' Society and for two and a half years he was in charge of the research Laboratory of the Hanson-Van-Winkle-Munning Company, Matawan, N. J., as chemical engineer. Dr. Graham has spoken at numerous meetings and has published many papers in the technical press and in the journals of the American Electrochemical Society and the American Electroplaters' Society. In 1927 his paper on "Spotting Out" received the first prize at the Convention of the American Electroplaters' Society.

George B. Hogaboom

George B. Hogaboom has a record of forty years in electroplating. He taught plating in the Newark Technical High School for three years, worked for the War and Navy Departments during the war, traveling under the direction of the Bureau of Standards as electroplating advisor. After the war he became a member of the Electrochemical Division of the Bureau of Standards as advisor on electrodeposition.

His experience in electroplating has been remarkably broad in its scope. He has engaged in silverplating; had job shop and jewelry experience; he has been head of the plating department of

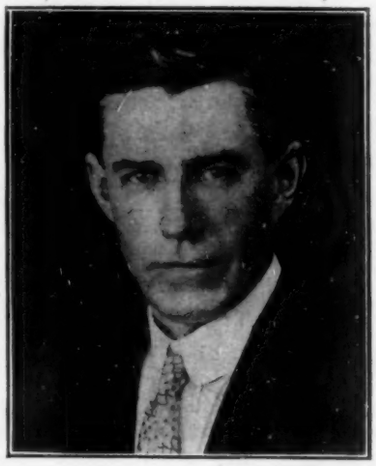
George B. Hogaboom

the P. and F. Corbin Division of the American Hardware Corporation. He was in charge of the Rogers 1847 flatware silver plating for the International Silver Company. He was for five years in charge of research work on plating and finishing for the Scovill Manufacturing Company. His experience extends to engineering development and installation of electroplating equipment. At present he is chief electrochemical engineer on this for the Hanson-Van Winkle-Munning Company, Matawan, N. J.

Mr. Hogaboom is a joint author of the book "Principles of Electroplating and Electroforming" with Dr. William Blum of the Bureau of Standards, is a member of the American Chemical Society, the American Society for Testing Materials, and the Electroplaters' and Electrodepositors Technical Society of Great Britain. He is vice-president of the American Electrochemical Society and a past president of the American Electroplaters' Society, a charter member of the last organization and its first president. In 1928 he was awarded the Founders' Gold Medal for the best work of the year in electroplating and first prize for the best paper.

Oliver J. Sizelove

Oliver J. Sizelove, whose biography was given in detail in our July, 1929, issue, is head of the plating and finishing department of the August Goertz Company, Newark, N. J. Mr. Sizelove's plating experience began at the age of 18 with an apprenticeship in the Estate Stove Company of Hamilton, Ohio. This was followed by a working as a plater and later in charge of polishing and plating departments of such firms as Fred J. Meyer Manufacturing



Oliver J. Sizelove

Company of Hamilton, Ohio, and Felker-Mieth Company, Dayton, Ohio. In the east, Mr. Sizelove was in charge of plating and polishing with the Bonny-Veslage Tool Company of Newark. During his period of work with this concern he enrolled at the Newark Technical School, specializing in chemistry for five years.

Mr. Sizelove's varied experience has stood him in good stead. He was with the J. K. Osborne Manufacturing Company of Harrison, N. J., Elite Novelty Company of Newark, and for the past seven years has been in charge of all polishing, plating, finishing and lacquering and inspection work for the August Goertz Company of Newark. He has been a prominent figure in the Newark Branch of the American Electroplaters' Society and one of the leaders of the national society. In 1926 Mr. Sizelove received the Founder's medal for submitting the best paper of the year to the American Electroplaters' Society. This paper was published on Simplified Methods of Analysis and Control of Electroplating Solutions.

Mr. Sizelove is now giving a course on the electro-chemistry of plating for the benefit of the members of the Society and all foremen electroplaters. The course is given in co-operation with the Essex County Vocational School Board, and at the Newark Boys' Vocational School.

Electrodeposition of Non-Metallic Materials

Their Properties and Peculiarities Under This Process.

By MILFORD H. CORBIN

Technical Service Department, Roxalin Flexible Lacquer Company, Long Island City, N. Y.

A PAPER READ AT THE MEETING OF THE AMERICAN ELECTROPLATERS SOCIETY, DETROIT, MICH., JULY 10, 1929.

AT first sight, non-metallic materials would not appear promising for electro chemical processes because of their high insulating properties. Therefore, I would like to preface the actual subject by a brief comparison of the properties of the electrically charged particles well known to you as ions, as against the properties of the electrically charged organic suspensions.

In the first case, these ions are vehicles by which the current is transported through the solution and undergo either an oxidation or reduction. For example, in the case of a copper sulphate solution (during electrolysis) the copper ion transports the positive current to the cathode where it is reduced to the metallic form. This electrolytic process and its resulting effects is thoroughly familiar to you. On the other hand, in the case of non-metallic materials, we have solids or small globules of liquid suspended in a liquid known as the external phase.

To give you a specific example, let us take castor oil which you are all familiar with, and mix it with water. After shaking this mixture (illustration) we find small globules of the oil suspended in the water, but on standing a few moments, the oil and the water separate into their respective layers. Now, if a soap or similar material is added, these globules will remain in suspension for a long time, because each globule has become coated with a fine layer of emulsifying agent, or "protective colloid" (illustration). The important point which we wish to bring out at this stage is the fact that these very fine globules of oil which are suspended in the external phase (in this case pure water) possess like charges. Hence when the particles or globules tend to coalesce or run together, the like charges cause them to repel each other, thus keeping them in constant vibration. This is known as the Brownian movement. When an opposite charged particle is put in their midst, they are attracted and defloculate or come out of suspension. Therefore, when two electrodes are placed into a suspension or an emulsion of this kind, the suspended charged particles are attracted to the oppositely charged electrode, and this migration of these suspended particles is termed "electrophoresis." Therefore, you see that the distinction between electrolysis on the one hand, and electrophoresis on the other, depends on whether a solution or suspension is involved. You see then that if we can take a finishing or coating material, such as rubber, asphaltum, lacquer, or an analagous material, and permanently suspend them in water as the external phase, these suspended particles will naturally assume an electrical charge, and it will be possible to deposit the suspended material on an electrode if a current is passed through the suspension.

Probably the most highly developed process of depositing non-metallic materials is the anode process used for the electrodeposition of rubber. Latex is a natural emulsion of pure rubber in an aqueous external phase, and looks like fine milk, but is very much whiter in color, such as you see in this beaker. The rubber globule is about one micron or .00004 inches in diameter, and carries a negative charge. When the current has passed through the latex, pure rubber is deposited on the anode, as we will now demonstrate. Of course, commercially, it is necessary to have incorporated in the globule the required filler, accelerator, softener, etc., according to the specific requirements of the finally deposited rubber compound, so that when the deposited film is vulcanized or cured under the proper conditions, a finished product results. Since the mass of the suspended particles relative to their charge is large compared to the ion, it is therefore obvious that the current efficiency is exceptionally high. For example, 160 times as much rubber can be deposited by the same amount of current than nickel, giving a deposit 1,400 times as thick as the nickel deposit (illustrate rubber deposition). While this deposition is taking place, we wish to show you here a number of finished samples of electro deposited rubber, illustrating the specific commercial applications. This process was developed by Sheppard, Eberlin, and Beal in the Eastman Kodak Research Laboratories. They found that about 30 to 50 volts and a current density of 1/10 to ⅓ ampere per square inch gives satisfactory deposits.

In the second beaker, we have an emulsion where asphaltum paint is suspended in water, and from this emulsion we will deposit the asphaltum paint on the anode (illustration of electrodeposition of asphalt). This, I understand, is also commercially applied in reclaiming asphaltum from residual oils, and used for japanning. In this process, the asphalt is plated out on the article which is used as the anode, and subsequently baked, giving a hard japan coating (illustration). We also wish to show in this third beaker that a nitrocellulose lacquer, complex in structure, can be uniformly suspended in water. Ordinarily, one would suppose water in contact with lacquer would cause a precipitation of the cotton, but by incorporating the proper protective colloid, we were able to hold them in suspension in their original form. The lacquer globules so suspended also carry a negative charge, and as a result, when the electric current is passed through the emulsion, electrophoresis takes place, and the lacquer particles deposit in a continuous film at the anode (illustration of electrodeposition of lacquer).

This is purely a theoretical application, and is in a very much primitive stage. The electrodeposited film, although continuous in nature, does not possess the necessary properties at this stage of development to have any immediate commercial application. However, it shows some of the remote possibilities awaiting the electroplater that in the future he will not only be called on to deposit inorganic or metallic coatings, but will be asked to deposit organic materials similar to what has been shown, including such things as dyeing, painting, and coating metals and non-metals.

We wish to express our appreciation to the B. F. Goodrich Rubber Company for the use of the samples of the electrodeposited rubber.

A Report on the Possibilities of Poisoning From Cadmium Plate

The Use of Cadmium in Contact With Foods Should Be Avoided

By GEORGE P. DUBPERRIELL
Chemist, Udylite Process Company, Detroit, Mich.

A PAPER READ AT THE MEETING OF THE AMERICAN ELECTROPLATERS' SOCIETY, DETROIT, MICH., JULY 9, 1929.

THE question of the possibilities of poisoning from cadmium plate frequently comes up, but the published information on this subject is very scarce. The possibilities are often vastly overestimated, there being no definite evidence available to the contrary. Under these circumstances it would appear advisable to discuss in detail the possibilities of poisoning in order to define them.

There appear to be no cases on record of persons having died from cadmium poisoning due to cadmium plate or cadmium salts.

An authoritative text book on the subject of "Toxicology" states that, "So far as one may find, no deaths have been reported from employment of cadmium salts and in man the acute effects are those of a gastro-intestinal irritant."

A British engineer is said (Chemical Trade Journal, Volume 75, pages 3 to 5, 1924) to have died from the effects of cadmium vapor which he inhaled when some cadmium was melted and over-heated in an open crucible, instead of in the regular furnace, which was out of order at the time.

There is no danger of this kind in the use of cadmium plated products, as the quantity of cadmium on them is so small.

Legal Aspects

Only one article appears to have been published on the use of cadmium as a coating metal for food containers, and that is in German (Zeit, fur Unters. der Lebensmittel, Volume 54, pages 392-6, May, 1927). Lead and zinc are prohibited in contact with foods in Germany, and this article is mainly a plea for the inclusion of cadmium in the lead-zinc law.

Here in the U. S. the Bureau of Animal Industry of the Department of Agriculture has prohibited the use of both zinc and cadmium in direct contact with meat or meat food products for considerable periods of time. This does not mean the complete prohibition of cadmium or zinc plating in the packing houses, however, and it is, of course, permissible to protect various parts of mechanical equipment, etc., from rusting in this manner, as long as they do not come into direct contact with meat or meat food products for a long time.

Cadmium in Medicine

Cadmium salts are not accurately described as poisons to the human system from the ordinary person's point of view.

In some cases they have been prescribed by physicians for use as an emetic. The government chemists have shown that cadmium salts are 8 to 9 times as effective as zinc salts when used as an emetic. The same men, and also many other workers, have found no cumulative effects of cadmium salts when fed to animals for long periods of time. (Journal of Pharm. and Exp. Therap., Volume 21, pages 1-22, 59-64, 1923 and Journal Pharmacol. Proc. Volume 13, pages 504-5, 1919.) The effect of cadmium salts when taken internally is to cause severe vomiting, diarrhea, nausea, headache, etc., and temporary local injuries to certain internal organs. The most severe case on record was described by G. A. Wheeler in Boston Med. & Surg. J., Vol. 95, P. 434-6, 1876, in which several women took from .25 to 1 grams of cadmium bromide each accidentally; both were made violently ill; one recovered in about 24 hours and the other recovered in about 5 days.

Action of Foodstuffs on Cadmium

Cadmium salts have valuable antiseptic and bactericidal properties and have been recommended for various therapeutic uses.

Cadmium is only very slightly soluble in neutral or alkaline solutions, and in solutions of organic substances in general. It is, however, slightly soluble in weakly acid solutions, which sometimes occur in connection with foodstuffs.

Zinc, on the contrary, is soluble in both acid and alkaline media and generally at a greater rate owing to its higher solution pressure. The difference between zinc and cadmium salts considered as poisons is one of degree only, the cadmium salts being stronger in their action.

Cadmium metal is fairly rapidly attacked by any foodstuffs of an acid character, such as vinegar, hard cider, fruit acids, etc. Fresh meat, blood, milk, etc., have practically no action upon metallic cadmium when they are fresh and edible, because they are slightly alkaline in reaction.

However, when these protein-containing foodstuffs decompose or turn sour, they generate acids or amino compounds which can have an action on cadmium, and when the cadmium is then dissolved, it causes sickness for a few hours or a day if sufficient quantities are ingested into the human system. We have actually encountered at least several such cases of sickness caused by cadmium getting into foodstuffs; the results in these cases were rather unpleasant, and painful internal disturbances, frequent vomiting, etc., occurred as a result of the contamination.

The situation can probably be summarized as follows: Cadium in its dissolved state is a powerful emetic and its general use in contact with foods is to be avoided. It is only possible to use it in specific cases where the conditions are definitely known and do not vary, where the foodstuffs in question is neutral or alkaline in reaction, and will not turn acid.

Acid food products such as vinegar, lemon juice, and other fruit juices, sour milk, etc., may attack cadmium plate quite readily and cause illness to persons who eat the foodstuffs.

Cadmium Plating

The Value of This Process for Resistance to Corrosion. Properties of the Coating.

By H. C. PIERCE
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A PAPER READ AT THE MEETING OF THE AMERICAN ELECTROPLATERS' SOCIETY, IN DETROIT, MICH., JULY 9, 1929.

THE corrosion of metals and its prevention is daily receiving more and more notice, and is today one of our major engineering problems. The numerous works and publications of recent years show the activity of the investigators in this field; a field of paramount importance, but one of the most complicated and least known in all chemistry.

The goal of the investigator in corrosion has been to thoroughly grasp the fundamental laws of corrosion, which, however, has been very difficult, as the possibilities of corrosion of industrial products are almost unlimited. It can only be predicted to what influence a material will be subjected, so that all precautionary methods of protection are more or less one sided. The progress made in this field shows that the engineer is not as helpless in combating corrosion as in former times. Ways and means can and will be found to combat this resistless attack.

An accurate estimate of the loss resulting from corrosion of the metals in common use is quite impossible. This yearly loss is known to amount to millions of dollars. Much of this loss is invisible to the casual observer, but it is only necessary to observe a few of our junk yards to have this fact forcibly brought to mind. Some part of the corroded metal is recovered as scrap, but the cost of replacing such parts far exceeds this saving. Rusting and corrosion may also impair the strength of structures and machines, thus endangering not only property, but human lives.

Aside from the actual destruction of parts, and cost of replacement, there is still another factor of extreme importance. Roughly, the loss and replacement of 1000 tons of steel gives a depletion to our national resources equivalent to 2000 tons ore, 4000 tons coal, 500 tons limestone, together with magnesite, chromite, etc. The labor required also involves a large number of man hours.

The more numerous the uses of a product, the more are the kinds of corrosive attacks to which it is subjected. The best example is that of iron and its alloys, which are used in all branches of industry and technology. The widespread use of iron has been the means of bringing forth almost countless methods for protecting iron from corrosive attack. The method of protecting the surface depends primarily on the use to which the article will be subjected. Of the various methods used in protecting metal surfaces, metal coatings and methods of their application play a particularly important part. Various metals have been successfully used as metal coatings on other metals. Gold, silver, lead, tin, nickel, copper, brass, chromium, zinc and cadmium have all been used in an attempt to stop or to retard the resistless advance of corrosion. Each metal has its own specific properties, so that each metal has its own particular field of usefulness in this relentless battle against corrosion. Likewise, these same specific properties often limit the value of a metal as a rust-proofing agent.

One metal, however, has been found to be of particular value in protecting ferrous metals against corrosion under a maximum of conditions. This metal is cadmium. Cadmium was discovered by the German Chemist Stromeyer in 1817, while investigating the peculiar yellow color of a zinc oxide. Although discovered in 1817, it is a comparatively new metal industrially. Most metals, especially those found of value in the plating industry, occur naturally in ores and are more or less easily obtained. Metallic cadmium does not occur naturally, and there is no ore of cadmium, or mineral, of which cadmium is the main constituent. Only certain compounds of cadmium—mainly carbonates and sulphides—are found associated in minute quantities with the ores of zinc, and in still lesser quantities with the ores of lead and copper. Actually, the presence of cadimum in lead and copper ores is due solely to the presence in them of zinc compounds or minerals, in the absence of which, the ores would be cadmium free.

The ratio of cadmium to zinc varies greatly, and is often too small to be of any value whatever. The useful ratio varies roughly from 1 to 160 to 1 to 400, the latter ratio probably being nearer the average than the former. The production of cadmium except as a by-product is, of course, unprofitable, so its extraction is always associated with the metallurgy of the ore in which cadmium occurs.

Even though cadmium is obtained only as a by-product, the purity of commercial cadmium is extremely high, it usually containing less than 0.5% of foreign matter, and usually approaches 99.9% purity. The impurities usually found are traces of zinc, iron, lead, tin, copper, nickel, and very occasionally, traces of thallium.

The production of metallic cadmium has increased more than tenfold in the last ten years. In 1919, approximately 100,000 pounds of metallic cadmium were produced in the United States, while in 1927, 1,074,654 pounds of metallic cadmium were produced. Figures for 1928 have not been obtained, but undoubtedly exceed those of 1927.

The use of cadmium for electro-deposition has increased even more rapidly. In 1922, with a cadmium production of approximately 131,000 pounds, most of which was used in the manufacture of paints, chemicals, solders, etc., only a few hundred pounds were used for electroplating purposes. From that time on the increase was rapid. In 1928, the Udylite Process Company alone used approximately 650,000 pounds. In the first four months of 1929 the Udylite Process Company actually sold and delivered to Udylite licensees 329,000 pounds of cadmium metal. This means that during 1929 one company alone will handle approximately 1,000,000 pounds of cadmium metal for electroplating purposes exclusively.

When it is considered that the average coating is only 0.0002" thick, the volume of work covered assumes staggering proportions. This amount of cadmium metal if spread on the earth's surface to a thickness of 0.0002", would cover an area of approximately 4 square miles, or 2,500 acres.

The color of cadmium metal itself is very often referred to as tin color, but it may be described as having a silver white color with a blueish tinge, and is more

nearly the color of steel than of tin, which possesses a yellowish cast. Cadmium has a brilliant luster when freshly cut or polished, but becomes dull when exposed to the air. Cadmium crystallizes in hexagonal pyramids. The metal shows no cleavage, the fracture is brilliant and crystalline when pure, but fine grained and dull when impure. Pure cadmium sticks, when bent, give a sound very similar to the so-called "tin cry." Impure cadmium sticks do not give this cry when bent, so in an emergency this test may be used as a rough test of purity.

Cadmium is soluble in most acids. Strong alkalies, such as caustic soda or caustic potash, which dissolve zinc very rapidly, have little or no action on cadmium. Cadmium combines directly with chlorine, bromine and iodine when placed in solutions of those elements. Cadmium is also soluble in ammonium nitrate.

Cadmium is harder than tin and softer than zinc. It is malleable and ductile at ordinary temperatures. Being soft, cadmium will not resist heavy mechanical wear, nor the action of abrasives. On the other hand, its softness and ductility make it more resistant than zinc or nickel to knocks or blows, just as a tough elastic enamel will outlast a brittle enamel.

The electro-deposition of cadmium has developed almost entirely in the last ten years. Acid and ammoniacal solutions have been proposed at various times, but such solutions were found to be quite unstable, changing in composition quite rapidly, and producing a crystalline or porous deposit. This latter evil could only be partially remedied by the use of addition agents of various sorts. Cyanide solutions, even without addition agents, produce finely crystalline, though dull deposits, while various well-known addition agents not only reduce the crystalline size still further, but impart a lustrous color very pleasing to the eye. Cyanide solutions are relatively stable as compared to acid or ammoniacal solutions, requiring a minimum of care under severe conditions. As a consequence, cyanide solutions are mainly used for the electro-deposition of cadmium.

A metallic coating may protect the ferrous base either chemically or mechanically or both. Cadmium protects both chemically and mechanically. To protect the ferrous basic metal chemically, the coating metal must stand above iron in the electro-motive series, so that in case the underlying metal is exposed, and moisture is present, which is almost invariably the case, the coating metal will function as anode in the little galvanic battery so formed, and corrode in preference to the basic metal. Some difficulty has been found in placing cadmium accurately relative to iron. Apparently, in the presence of moisture and corrosive substances, the easily changing iron potential and the overvoltage of hydrogen on iron, play a decided role. Regardless of the difficulty of definitely establishing the position of cadmium, practical experience has shown that cadmium undoubtedly stands above iron, and that it is now the best rust-proofing agent, bar none.

Cadmium also protects mechanically. Even though cadmium is electronegative to iron, and porosity does not mean immediate rusting of the underlying iron, it is essential that the plate be as free as possible from porosity, in order that maximum benefit be derived from its properties. The ideal plate must also have perfect adherency, be free of blisters and irregularities, be ductile, dense and preferably bright in color. Cadmium deposits with such characteristics are obtained from most of the cadmium solutions in use today.

Efficient results in cadmium plating, as in other types of plating, depend essentially on three factors:—the proper type of solution, and means of controlling this solution, proper electrical conditions, and proper handling of work. Under this latter may be included cleaning, pickling, rinsing before and after plating, handling, storage, etc.

The majority of solutions used today for the electro-deposition of cadmium produce deposits of finest crystalline structure and a minimum of porosity, as well as maintaining a constant composition under a maximum of varied operating conditions. Even with an ideal solution, work may often be spoiled by bad electrical connections. All leads should be of sufficient size to carry the necessary current, and all connections and contacts should be clean and tight. A source of trouble which is often overlooked are the contacts which the anode hooks make. All other connections are made by means of clamps or bolts. Here, however, contact is nearly always made by mere suspension, so that even under ideal conditions, there is a possibility of electrical loss. Corrosion products often form under the anode hooks, thus increasing the electrical losses still further. Even with proper leads and connections all the way from the generator to the solution, there is a final point often overlooked. Wires and racks for hanging work must be of a size to carry the necessary current. Obviously, a part which required 30 amperes for proper plating, should not be suspended on a wire with a carrying capacity of only 15-20 amperes. This, however, is often done.

Even after work has been hung in the plating bath, it may be spoiled by improper amperage, or current distribution. In the matter of current distribution, best results are naturally obtained with only one piece in the tank at a time. In production, however, the tank must be loaded, and often loaded with pieces of varied size. Current is free to pass through various channels, and the amount that does pass through a given piece is a function of the size of the piece; contacts to anode and cathode, size of racks or wires; distance away from anode; the solution itself, and finally the voltage impressed. Each time the tank is loaded, the chief variables are the number, size and shape of the pieces, and the contacts. The operator should see to it that each piece is gasing as evenly as possible, that the contacts do not become hot, and that the plate is as evenly deposited as possible. Sharp edges always receive the most current, consequently they will brighten first. If the edges are dark, the work is burned, which indicates too much current. It is best to strike a happy medium between high and low current density.

Poor cleaning is responsible for a multitude of plating ills. This is readily recognized and accepted, but it is very difficult to remedy in many cases. Since the cleaning problem is usually an individual problem, and so many excellent articles have been written on cleaning and pickling, which latter may be considered a branch of cleaning, that I will not go deeply into this subject. I will merely state, that even though it is sometimes possible to obtain a good cadmium deposit on dirty looking work, consistently efficient results can only be obtained by perfect cleanliness at every step in the plating department.

After the work has been cadmium plated, it should be immediately rinsed in cold water and then in hot water at approximately boiling temperature. The water should be clean to prevent staining. Where facilities permit, small parts may be dried in a centrifugal, which eliminates water staining.

The plated work should be removed as soon as possible from the acid fumes and steam atmosphere of the plating room; it should be stored in clean boxes, handled by clean hands and placed upon clean work benches.

In this paper, I have endeavored to show very briefly the necessity for such a metal as cadmium, its origin, its development and rise to a most commanding position in the electroplating world, and general discussion of the best practice to insure successful cadmium plating.

Electroplating with Cadmium

A Review of the United States Patents Relating to the Plating of Cadmium—Conclusion*

By JOSEPH ROSSMAN
Patent Examiner, U. S. Patent Office, Washington, D. C.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE following abstract gives a review of the U. S. patents on cadmium plating:

1. **Classen 273,467. Mar. 6, 1883.**

The process of obtaining compact and brilliant coatings or plating of metals, consisting in converting the solution of the coating metal by oxalate of potassium into double salts of potassium, adding a surplus of oxalate of ammonium, then adding carbonate of soda and precipitating the metal by connecting the object to be plated with the zinc pole of a battery, immersing it into the bath, and connecting the other pole of the battery with a sheet of platinum or carbon, which is also immersed.

2. **Cowper-Coles 487,176. Nov. 29, 1892.**

An electrolytic bath is prepared by dissolving a suitable quantity of cyanide of zinc or cadmium in a solution of cyanide of potassium, so as to form a double salt having a slight excess of cyanide of potassium. To this solution a small quantity of the double salt of the cyanide of potassium and silver is added, the two together forming the electrolyte or electrolytic bath, which is introduced into any suitable electroplating or electrotyping apparatus. An anode is employed composed of an alloy of zinc and silver or cadmium and silver in the same or approximately the same proportions as are desired in the alloy to be deposited. For example, for the deposition of an alloy composed of equal parts, by weight, or silver, and cadmium an anode is used composed of equal or about equal parts of the said metals.

3. **Nussbaus 832,024. Sept. 25, 1906.**

The process of electrodepositing metals which consists in adding to the electrolyte in minute quantity a colloidal substance which has the characteristic of wandering to the cathode, and subjecting the electrolyte to electrolysis.

4. **Maring 1,073,432. Sept.. 16, 1913.**

For depositing cadmium or zinc ammonium sulfate salts of the metals are used in order to obtain a malleable and ductile deposit. A solution of the salts of these metals possesses high conductivity and zinc or cadmium anodes dissolve in it very easily.

5. **Hunt and Gidden 1,264,802. Apr. 30, 1918.**

The process of treating an acid solution containing both sulfate of cadmium and sulphate of zinc which comprises electrolytically depositing the major portion of its cadmium content without depositing any considerable portion of its zinc content, thereafter neutralizing the solution, and adding metallic zinc in excess whereby the remaining cadmium is precipitated, and a zinc sulfate solution left.

6. **Udy and Nicholson 1,383,174. June 28, 1921.**

The process of treating a piano wire to make it rust proof, which consists in electroplating the wire with a thin coating of cadmium, then subjecting the wire to heat under conditions which cause the coating to alloy to the wire and to be outwardly oxidized and then polishing the wire.

7. **Udy and Nicholson 1,383,175. June 28, 1921.**

The process of protecting steel springs against rusting, which consists in electroplating the springs with cadmium and subjecting the coated springs to heat under conditions preventing excessive oxidation of the cadmium coating.

8. **Udy and Nicholson 1,383,176. June 28, 1921.**

The process of protecting an edged steel article against rusting, which consists in electroplating the article with cadmium and subjecting the coated article to heat under conditions preventing excessive oxidation of the cadmium coating.

9. **Wissler and Humphries 1,504,298. Aug. 12, 1924.**

The method of rust proofing metallic articles which consists in electrodepositing thereon metallic cadmium from a basic or neutral cyanide solution of cadmium, the current being maintained at such current density that gas is freely evolved from the anode and cathode, a graphite, carbon or non-polarizing anode being used.

10. **Wernlund 1,518,622. Dec. 9, 1924.**

A metal article having an electrolytic coating comprising cadmium and mercury, cadmium being a major constituent.

11. **Moyer and Stewart 1,529,803. Mar. 17, 1925.**

A mold comprising a body of metal and a coating of cadium thereon to prevent an article molded therein from adhering thereto.

12. **Humphries 1,536,858. May 5, 1925.**

The method of obtaining a bright coherent dense coating of metallic cadmium on another metal which consists in electrodepositing cadmium from a cyanide solution in presence of an addition agent in quantity sufficient to produce an appreciable brightening effect but not exceeding 5%, a graphite carbon or non-polarizing anode being used.

13. **Humphries 1,536,859. May 5, 1925.**

Method of obtaining bright, dense, coherent deposits of cadmium upon another metal which comprises electrodepositing cadmium from a cyanide solution thereof in the presence of a protein addition agent.

14. **Young 1,537,020. May 5, 1925.**

Method of obtaining bright, dense, coherent deposits of cadmium upon another metal, which comprises electrodepositing cadmium from a cyanide solution to which a relatively small amount of unsweetened half-volume evaporated milk has been added.

15. **Louth and Young 1,537,047. May 5, 1925.**

Process of electroplating with cadmium which comprises electrodepositing cadmium from a sodium cadmium cyanide solution containing from ¼ to 6 ounces of cadmium and from 2½ to 6 ounces of free sodium cyanide per gallon in the presence of an anode comprising metallic

* The first part of this article appeared in our July issue.

cadmium and an inactive conductive material at a current density of from 4 to 30 amperes per square foot in the presence of an addition agent.

16. Wernlund 1,555,537. Sept. 29, 1925.

Method of electrodepositing a rust resistant deposit of cadmium and mercury which consists in electrodepositing these metals from a solution of their salts in an aqueous sodium cyanide sodium hydroxide solution wherein the article receiving the deposit is the cathode and an alloy of cadmium and mercury is the anode.

17. Wernlund 1,556,271. Oct. 6, 1925.

The method of electrodepositing an alloy coating comprising zinc and cadmium which consists in making the article to be plated the cathode and providing an anode whose major constituents is zinc and whose minor constituents is at least 2% of cadmium.

18. Wernlund 1,556,272. Oct. 6, 1925.

The method of electrodepositing an alloy coating of zinc, cadmium and mercury comprising cadmium from 2-30%, zinc from 70-97%, and mercury from 1-2% which consists in electrodepositing these metals from a solution of their salts in corresponding proportions in an aqueous sodium cyanide-sodium hydroxide solution.

19. Hoff 1,564,413. Dec. 8, 1925.

Process of electrodepositing cadmium which consists in preparing a mixture of cadmium sulfate and zinc sulfate from a raw material containing cadmium and zinc or their compounds, dissolving the mixture in an aqueous solution of ammonia, adding an alkali metal cyanide to the solution and subjecting the resulting solution to electrolysis.

20. Hoff 1,564,414. Dec. 8, 1925.

A composition adapted for use for the preparation of a cadmium plating bath consisting of a dry mixture comprising cadmium hydroxide and ammonium sulfate.

21. Humphries 1,615,585. Jan. 25, 1927.

A piece of iron or steel having a coating comprising a layer of cadmium and a superposed layer of chromium.

22. Jones and Atuesta 1,615,707. Jan. 25, 1927.

An article of manufacture comprising a body of ferrous metal, a film of cadmium thereon and a film of tin overlaying the cadmium film. The electrolytic potential of tin with respect to a ferrous metal is so considerable that a ferrous metal article coated with tin alone would be attacked very rapidly in the presence of an electrolyte such as water containing an acid wherever the tin coating was locally imperfect due to wear, or an accidental scratch or any other reason. The presence of the cadmium however will protect the ferrous metal even when the tin coating is marred.

23. Westbrook 1,681,509. Aug. 21, 1928.

A cadmium plating composition comprising about 50 parts of cadmium hydroxide, about 0.18 parts of nickel as nickel sulfate, about 38 parts of sodium sulfate, about 11.5 parts of gulac and about 100 parts of sodium cyanide.

24. Young and Louth, 1,692,240, November 20, 1928.

Cadmium is electro plated from a cyanid bath in the presence of an addition agent comprising an extract of bran, an extract of wheat and carmelized molasses.

Lead Coating Tubes

Q.—We use a few steel perforated tubes of sizes ranging from 1 in. in diameter to 20 in. and from 2 in. to 3 ft. long, 14 to 20 gage black iron. These tubes have to be lead coated inside and out. We would like to know the best procedure for hot lead dipping, also the temperature at which to keep the molten lead.

A.—The coating of steel by hot dipping in pure lead is a difficult process, commonly attended by unsatisfactory results, and for this reason the method has not been widely used. Pin holes through the coating are very likely to be present and, since lead is cathodic to iron, their presence is very serious, resulting in rapid attack of the steel when exposed to a corrosive liquid or atmosphere.

The use of terne plate, consisting of lead with 15 to 30 per cent of tin, is more common but subject to somewhat the same difficulties particularly if the article to be coated is not perfectly smooth and flat. U. S. patent 1,660,847 issued to E. R. Milbring, specifies the use of lead to which phosphor lead has been added and containing about three per cent of tin to increase the phosphorus solubility.

More impervious coatings are produced by electroplating with lead using, for example, a fluoborate solution with glue or some other suitable addition agent to obtain a fine grained, dense deposit. The work should be cleaned before plating by sand blasting rather than by a chemical method. Impervious deposits as thin as 0.003 inches can be produced although a thicker plate is somewhat safer. Buffing or burnishing by means of steel balls may be employed as an added precaution to ensure a coating free from pinholes.

If hot lead dipping must be used the work should first be pickled in 10 per cent sulphuric acid at about 160° F., then carefully rinsed, first in cold water followed by hot water. The lead bath should be maintained at a temperature of not less than 700° F. and should be covered with an oil or flux to prevent oxidation of the lead. Both palm oil and rapeseed oil are used for this purpose.

—H. M. St. John.

New Uses for Lead

New uses for lead have come into prominence, according to Lewis A. Smith, in a report recently issued by the U. S. Bureau of Mines, Washington, D. C. Lead mattresses have aroused some interest as shock absorbers between the foundations and the steel framework of skyscrapers. In one building in New York about fifty-five tons were used for this purpose. "Amaloy," a comparatively new alloy of lead is growing in use, as a replacement of solder. This alloy consists of 98 per cent or more of lead, 1 per cent or less of tin and small quantities of phosphorus.

Aluminum Street Car

Recently in the daily press appeared an announcement of the "first aluminum street car in the world," to be run in Pittsburgh. This was an error, as shown by the fact that in our issue of May, 1928, we published a description and photograph of an aluminum street car used by the United Railways of St. Louis.

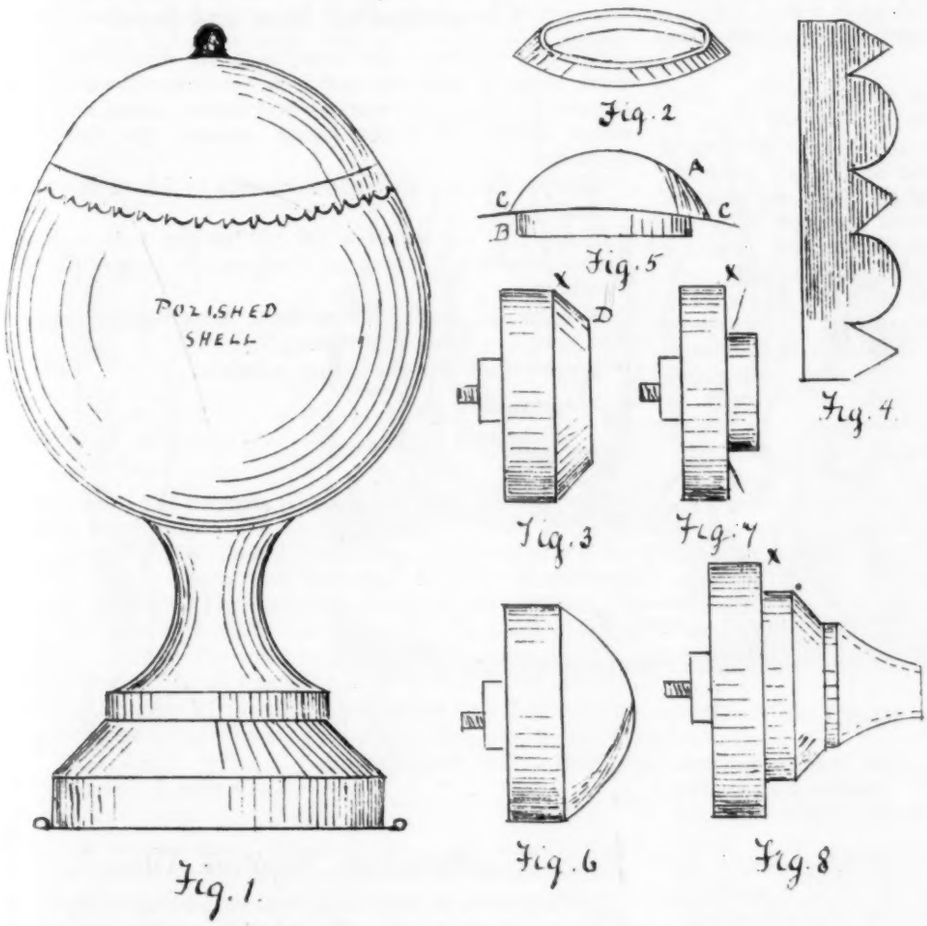
Spinning Metal Jars

How to Make a Cocoanut Jar Mounted in Spun Metal

By WILLIAM MASON
Metal Spinner

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE tobacco-jar illustrated by Fig. 1 consists of a cocoanut shell mounted in German silver. The shell should be as large and round as can be procured. First take off the top with a fine saw and remove the nut, so that the shell can be mounted as shown in Fig 1. Next smooth the shell with a file, and polish it in the same way as if it were metal; it will then have a nice dark surface, and nothing more need be done to it. The part to be spun first is that shown by Fig 2, the chuck being turned as in Fig. 3. When spun on to this chuck, the inside file. The mount should be made to fit the shell tight the longer way of the diameter. As a precaution against cracking, mallet round the edge on an iron stake before tempering it, taking care not to bruise it. In tempering, the metal should not be made red-hot, but just hot enough to clean all the grease from it, and the heating should be done gradually, otherwise it may crack and become useless. German silver should never be made harder than necessary in the spinning. In the chucks illustrated, X denotes the end of the spinning.



Parts of a Tobacco Jar Made of a Cocoanut Shell Mounted in German Silver, and Chucks Used in Spinning the Metal for it

of the chuck should be turned out, and the center of the spinning cut out (not at the corner), leaving enough metal to spin in with a small hook tool, as shown by dotted line D in Fig 3. The spinning should now fit the shell at the top. Care should be taken that it carries out the line of the shell, as in Fig. 1. Next cut out with the shears a small piece of metal, the same width as the mount, to the shape of Fig. 4. Using this as a template, place it on the mount and mark round with a scriber or lead-pencil, shifting the template round as required. Then cut round with shears, and finish with a small half-round smooth

The next part to be spun is the cover A (Fig. 5). Turn the chuck as shown in Fig. 6, and after spinning nearly down on the chuck, mallet around the edge, and soften by gradual heat; then resume spinning, leaving as soft as possible; temper and pickle in a very weak solution of aqua fortis (1 part of acid to 12 parts of water), or emery-cloth it ready for silver-soldering to the bezel. The bezel B (Fig. 5) is the next part to be spun, the chuck being turned as in Fig. 7. After this has been spun down, the flange should be slightly thrown back with a sharp narrow spinning tool, as shown by dotted lines, and the center

cut on the corner. It should then measure about ½ in. more in diameter than the cover, as shown at C (Fig.5). After being tempered and cleaned, the cover and bezel should be tied together with iron binding-wire and soldered with silver solder and borax, using a blowpipe, and taking care before soldering that the cover is perfectly true to the bezel. It will require a second pickling to clear away the borax, after which the flange (Fig. 5) may be cut off with the shears. It should then be fixed on a chuck and cleared of all superfluous solder. It is now in one piece, and should fit the scalloped mount.

The foot is all that remains to be spun. For this the chuck should be turned as in Fig 8; and after the first course has been spun, the metal is malleted round the neck in addition to the edge before being annealed. After spinning to the chuck, lap the edge to form a wire, as shown by dotted lines, and turn away part of the chuck in the neck, also indicated by dotted lines. Next hollow the neck as shown in Fig. 1 with the hook spinning tool, hollowing slightly at the top also to fit the bottom of the shell. A hole should then be drilled in the center, and another in the bottom of the shell, capable of taking a small piece of screwed German silver wire ⅛ in. in diameter; then with the aid of two small nuts to fit the wire the foot can be fastened to the shell. The knob for the top is fastened in like manner with a nut from the inside, and may be purchased almost anywhere. All the mounts will need electro-plating and burnishing, the scalloped portion being afterwards fixed with plaster-of-paris. The whole should be spun out of 0.025 in. metal.

Aluminum for Sulphuric Acid

Q.—I am about to manufacture an article of aluminum that must withstand dilute sulphuric acid.

The metal must be strong and at the same time must stand bending and also be threaded for a nut.

Can you recommend an aluminum alloy to meet these requirements?

A.—It is a little difficult for us to answer your question without knowing more about the size and shape of the piece you have in mind and how severe bending it must stand. If, for example, the article can be made from rod stock or as a forging, the problem is much simpler than it is if a sand casting is required.

Pure aluminum withstands the action of sulphuric acid exceedingly well, most aluminum alloys fairly well. If rod stock can be used the alloy containing 1.25% manganese, designated by the Aluminum Company of America as Alloy 3S, would be suitable. If it is convenient to use a forging, Alloy 51S containing 0.6% magnesium and 1.0% silicon should be satisfactory. If the article must be sand cast Alloy No. 43, containing 5.0% silicon is about the best possibility although a combination of strength and ability to stand bending is hard to get in a sand casting. By using the Aluminum Company's patented method very favorable results can be obtained by heat treating Alloy 195 which contains 4.0% copper. This would be better than No. 43 if the necessity for using a patented heat treatment is not an objection. —H. M. St. John.

Oxidized Copper Finish

Q.—You recently gave us a solution to oxidize copper plated screws. We have tried this solution and enclose samples produced. This finish is too bright for our purpose.

We are enclosing a sample screw showing exactly the finish we require, and we were wondering if it would be possible for you to advise us further with a view to obtaining the color on the customer's sample.

A.—The method that you have used on the screws that you have finished gives a finish that is an exact duplicate of your customer's sample.

You will notice, if you examine your product carefully, that the surface is quite rough and the slot has a burr, due to improper screw machine operations. This is the cause of the bright finish you refer to, for in the tumbling operation after bronzing, the rough part has been rubbed harder than the rest, causing the copper to show through the bronze finish.

When you have eliminated the roughness and the burr, we are sure that you will have no further trouble.

—Oliver J. Sizelove.

Chromium on Iron and Steel

Q.—My employers are going to install chromium. Our work being all steel and cast iron, we have a 6 volt, 1,500 ampere dynamo. All work is first copper plated and then nickel plated. Will you please answer the following questions:

What is the best chromium formula to use on this class of work?

The pH of my nickel is 5.6. What can I do to bring it up to about 6.2, which is, I believe, the proper pH for chromium?

What is the proper temperature, amperage per square foot, time of plating and upkeep?

A.—Formula for chromium solution:

Chromic acid	55 oz.
Sulphuric acid	3 oz. by weight
Water	1 gallon

Temperature, 95° F.; 35 to 50 amperes per square foot. A nickel solution with a pH of 5.6 is considered a little too low to produce a soft nickel deposit, which is necessary if chromium is to be deposited over same. A pH of 6 or 6.2 is better, and you can correct the pH by adding ammonium hydroxide to the solution, which will raise the pH.

If the work is copper plated for 45 minutes, copper colored, and plated with nickel for 1 or 1½ hours, nickel colored, and then chromium plated for 10 minutes, a satisfactory deposit will be obtained, providing all solutions are in proper working condition.

—Oliver J. Sizelove.

Non-Shrinking Tin-Zinc Alloy

Q.—We wish to cast small rollers without danger of shrinkage or blowholes. We have used a lead-tin alloy, but lead is objectionable due to its tendency to corrode when used in soap solutions. Do you think a die cast alloy would be good for our purpose? The metal we want should not be too hard.

A.—We suggest that you try an alloy of 54 tin, 54 zinc, 1 bismuth. This shrinks very little, if any, and should answer your purpose. It may cost more per pound than the lead-tin alloys you have tried, but it melts easily and casts well. It can be poured in the same manner as the lead-tin alloys you have been using.

—W. J. Reardon.

The Ancient Bronze Arts

A Brief Description of the Fundamentals and Methods of Procedure in Casting Decorative Bronzes

By FERDINAND KRETZ
Metal Worker

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

IN relation to the early bronze arts a great many things must be assumed as there are no authentic records of that time. It is generally believed to have originated in or about the eleventh century or possibly a little prior thereto. The discovery of this alloy and its adaptability to various uses must have prompted a desire by these ancients to create something artistic and durable from a metal they found to be highly fusible. It is possible that in their first methods of forming various objects, they may have started with a dry clay mold or some small engravings in shells and sand stones; or it could have been the same kind of a sand-heap which this core were placed various layers or sheets of wax up to a proper thickness for the metal. (See Fig. 1). It calls for a great deal of skill to build up a core for this purpose, in such a manner that all the details can be brought out in the modeling without distorting any of its features or the character of the model. The mass or molding heap made by them was called a Jesso and formed by a combination or mixture of silica, powdered burnt clay, dung or other fibrous materials to make it porous for venting purposes and a calx made from kilned sea-shells as the binder to set and harden the mass, thus making it possible to be handled about the same as our

Fig. 1. (left)—Sectional View Through Wax Model, Showing Composite Core in Dense-Lined Area and Various Unfinished Wax-Plates Layed Over It in White Areas. Fig. 2 (right)—An Ancient Method of Taking Metal from a Battery of Furnaces by Means of Channels Leading to a Reservoir

is in use to this day. However, we must assume that in their progress with this bronze they made considerable use of pit-molding or making their molds in the ground, so as to facilitate their handling, and that their higher class of molding must have been somewhat similar to our present lost wax process—that of heating a mold so as to melt out the inside wax pattern, thereby causing a cavity into which the metal can be poured.

From the viewpoint of the foundryman it would seem that the first necessity in such proceedings by the ancient artisan would be to make his inside core to work on, so as to make the cast hollow and thin to reduce the weight of the metal. This method is feasible, as an inside core of a refractory self-hardening substance could be built up to suit the artist's idea. Over and around present day stucco materials. Before a wax model of this kind can be invested or molded over with this compost mass it becomes necessary to form or roll some wax rods of a suitable size, which are applied by heat and fastened to the model in such a position that they may act as vents to relieve gas from pockets and for sprues or gates to pour metal into when the mold is finished. Three operations are necessary to complete the mold: first, the inside core; then, the laying on of the wax sheets to obtain the thickness of the metal; last, the covering of the entire model by a coat of the composite mass which forms the mold for casting purposes. After this mass had been bound together and firmly secured, means were provided for heating and melting out all traces of any wax from inside, thereby creating a cavity between the

inside core and its outside mold. As the rods melted away they served the purpose of relieving gas from pockets and acted as gates to run the metal through.

For casting in a mold of this kind, especially in one of large proportions, a pit in the ground is necessary into which the mold is placed, tucked in, covered up and secured in such a manner that the sprues and pour holes are on a sort of level that will receive the onflowing metal into the mold by gravity. On account of their primitive ways of handling metals and the limited size of their smelting apparatus, only small quantities of the materials could be melted at each time. Their furnaces were of a simple construction such as one stone layed upon another with cracks and openings large enough to get plenty of air and natural draught to their fuel. When a large-sized casting of some kind was made, several of these smelters were erected in order to get the amount of metal that was needed and were placed in a semi-circular position to a reservoir. (See Fig. 2), for in order to get control of the metal from a battery of furnaces of this kind, the molten metal would have to be directed by a means of channels leading into a reservoir.

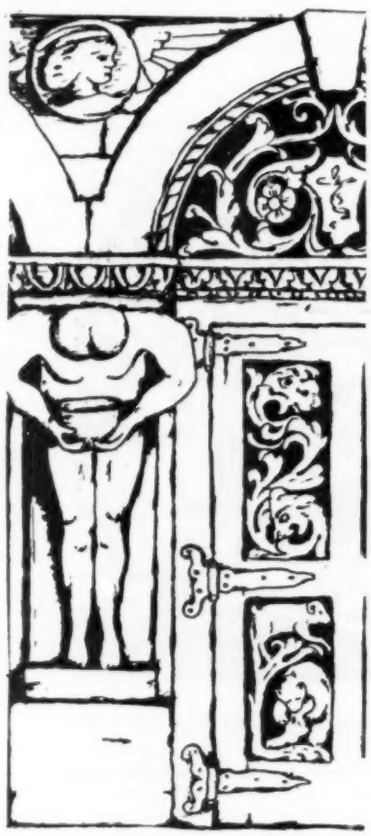


Fig. 3—An Old Romanesque Facade, Illustrating the Intermingling of Sculpture and Modeling in Architecture

The reservoir was built of stone and a fire-resisting clay and set very close to the molding pit to facilitate the handling of the metal, and at its very bottom a tap-hole was provided for drawing off the metal and running it directly down to the gates and sprues and into the mold to make the casting.

After the casting was removed from the pit and cleaned, it was subjected to a considerable amount of scraping off, and tooled over very carefully before it attained that wonderfully smooth surface that so many of these casts are noted for. However it must be generally understood, that time and labor could never have been a great factor in any of their undertakings, so it may be that by these methods as here described, many remarkable and artistic casts have been made by those old time masters of the bronze arts. During the many years that have elapsed since the early uses of bronze metals, it has gradually passed from the crudely made product to that of the highly developed commercial or manufactured bronzes of the present day. Bronze is no longer used for the purpose of casting statuary alone, but also extensively for decorative purposes in a great many classes of our architectural schemes such as enclosures, entrances, mausoleums, lighting-standards, tablets and so forth.

Modeling and Sculpture in the Bronze Arts

Concerning the casting of art-figures or architectural bronzes, it may be added, that the arts of sculpture and modeling are very closely connected. These arts are the fundamentals of artistic bronze work, for in them lies the foundation upon which the foundryman must base his skill to reproduce in bronze what the artist has already executed in clay, or built up of stucco, wax, or plaster. Usually an artist will specialize in either modeling or sculpture as these are recognized as separate lines of art, although they will frequently intermingle in architectural decorations. (See Fig. 3). So the artist undertaking the latter class of work, must have a general knowledge of both to combine figures with ornamentation. For the execution of suggestions on any such objects the artist

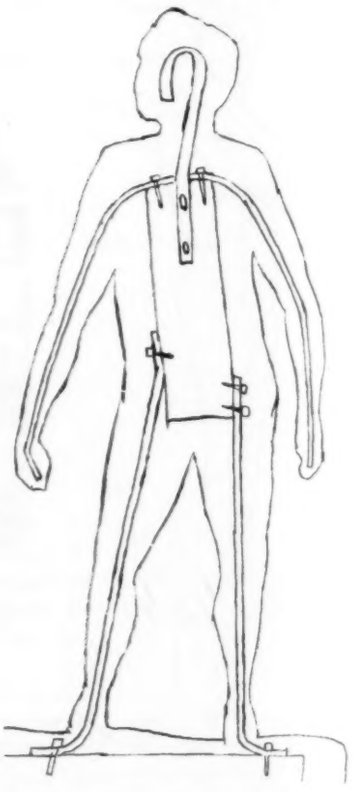


Fig. 4 — Illustration Showing Inner Construction of an Armature for Supporting the Built-up Clay for a Sculptured Figure. The Center Part of the Body is a Piece of Board or Scantling with Iron Bars or Rods Fastened to it. The Reinforcements are Covered to Some Extent with Plaster of Paris and Fibre is Wrapped Around them and Shellaced to Make it Easier for Them to Support the Masses of Wet Clay

is expected to be capable and original in his ideas, and his work must give an expression of its meaning, for in many cases competitive sketches for some proposed piece of art are often called for. When in a competition of this kind, the artists are called upon to originate something suitable to the purpose for which it is intended and to submit a clay sketch of their work. The sketches are studied and criticized by all parties interested, and one of them may be accepted and approved. The production is then left in the hands of the successful artist, for his

final execution of a full-sized figure or object of the original accepted sketch.

Reproducing a sketch of this kind to larger proportions is usually done in clay, and strong reinforcements must be provided for supporting the great weights and masses that are to be built up. Scantlings, rods, wires, etc., are used for this purpose, erected and fastened in such a manner that they act as a sort of inside skeleton for the clay to rest on, thus preventing any distortion or sagging of the clay. This reinforcing is called an "armature," (See Fig. 4). The enlargement from a small sketch of this kind in clay is sometimes done by the use of the pointing machine, a modern invention built upon the same principle as that of the hectograph.

Reconstruction of the enlarged model is often very necessary to give more mass or prominence to certain features of the model. This can be ascertained only by viewing the model at its correct height, studying its various lines and angles and the lights and shadows that may reflect upon it.

Consider these suggestions before placing a final O.K. upon them, as they are of great importance, for many features are either subdued or entirely obliterated and other necessary effects are lost through this over-sight. This suggestion does not apply to sculpture alone, for the architectural lines of modeling must by all means be studied in very much the same manner as that of sculpture.

Architectural modeling has its various styles of ornaments, which are usually blended in with the architectural lines, members, and projections of the building. When an architect has in mind to elaborate a building with ornaments, he designs and fills in the ornamentation according to the lines of architecture. His ideas of decoration are generally worked out on a small scale drawing to see what the effect will be. After this a full sized detailed drawing is sometimes tendered as a working drawing and this is usually preferred in many cases by the modeler to use as his guide. The architectural members or mouldings that are to surround the clay are generally made up of plaster of paris and are shown in the proper sizes and sections on the drawings. Within and over these plaster mouldings the modeler proceeds to work up his masses in clay and roughs out the general character of what the ornamentation is to be. This first procedure in modeling is termed "laying-on," and when these masses have been laid on and the general sketch worked out, the architect or designer is called in to pass upon, criticize or to see if the work has been kept in harmony and scale with the other features of his architectural scheme, and to make such changes as he may desire.

A New Solder for Electrical Apparatus

By DR. JAMES SILBERSTEIN

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Solders used for electrical apparatus generally consist of alloys of lead and tin, the most common having equal parts. All lead tin alloys, employed in ordinary practise start to melt at 183° C. (356° F.), which means that a joint soldered with any of them will soften and fail if heated to this temperature.

A solder having a higher melting point is very desirable for electrical joints, and pure tin, which has a melting point of 232° C. (450° F.) has been used extensively. However, tin is a rather expensive metal and the thermal advantage of tin over tin lead solders (the ability to withstand high temperatures under electric current) is not very marked, which has been demonstrated by tests. Attempts have naturally been made to replace tin and tin lead alloys, but so far none has been successful on a practical scale, due to the rather severe requirements which must be met by a solder. The most important of these requirements are ability to be employed with non-corrosive fluxes, and toughness and ductility of the solder, so that the joints will not fail under vibratory stresses.

Experiments and tests showed that alloys of lead and silver worked satisfactory as solders and an alloy containing lead as the base metal with 2½ per cent of silver and ¼ per cent of copper was finally adopted as the most suitable one for use in electrical apparatus. This alloy has a melting point of 304° C. (580° F.) and it can be used with the non-corrosive fluxes, ordinarily employed in soldering. The alloy is worked with an ordinary soldering iron, which of course has to be heated to a higher temperature than when lead tin solders are used.

The new solder has been applied in apparatus where common solders have failed on account of too high temperatures being encountered in service and has proven a success. In such cases and in other similar ones, where brazing alloys (melting at about 750° C. or 1400° F.) cannot be resorted to for one or another reason, the solder has been satisfactory. Its substitution for ordinary lead tin solders in such cases can, therefore, be recommended.

International Foundry Congress

The third International Foundry Congress was held in London, England, during the week of June 10th. The delegates were welcomed with enthusiasm by the City of London, both the authorities and the people showing them every consideration and courtesy to make their stay pleasant as well as worthwhile.

A special session was held on non-ferrous metals with Wesley Lambert, president of the Institute of British Foundrymen, as chairman. Mr. Lambert is a metallurgist of note, specializing on non-ferrous metals.

A paper on Practical Points from the Metallurgy of Cast Bronzes was read by H. D. Dews, Dewrance and Company, London. The author described his methods of overcoming difficulties involved in the casting of bronze, such as porosity, etc.

A. H. Mundy read a paper on Die Casting, giving a broad survey of the process.

A paper on Crystalline Grains in Castings was presented by Dr. A. Glazunov, professor at the school of mines, Pribram, Czechoslovakia.

Casting Shop Costs

Establishing a Furnace-Hour Rate for a Brass Casting Shop

By WALDO HUTCHINSON
Cost Accountant

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE system in force in one brass casting company at the present time is as follows: Each master caster operates under normal conditions five or six furnaces at a time; he is paid on a piece-work basis, the rate being expressed as so much per hundred pounds of good metal produced; and his helpers are paid so much a round, or charge. The sum of the caster's piece-rate and the helper's rate-per-charge constitutes the direct labor involved. All other costs, including foremen, core-making, fuel, maintenance, depreciation and rent, are grouped into one sum. The caster's piece-rate tickets indicate the shapes upon which he has worked and the amount of time consumed. The helper's wages are allocated to the product in the same proportion as the caster's, and overhead is loaded as an arbitrary percentage of the direct labor based upon past experience. Large balances of over or under-absorbed burden are common at the end of the month.

Recently some refinements of cost method have been introduced whereby overhead is added as a percentage of direct labor, differing according to the kind of mixture in question, since bronze, for example, takes roughly twice as long to melt as brass, while copper takes one and one-half times as long as brass. But for some time, it has been apparent that in order to meet competitive conditions a still more detailed and exact method of cost accounting for the casting shop work is necessary.

Proposed Furnace-Hour Rate—A test period of three months was decided upon. The potential theoretical production of the plant for a three months' period was computed by the engineers as 6,000,000 pounds. Allowing for repairs and idleness of equipment for all reasons, the engineers established a normal volume of production of 4,000,000 pounds. On this production all estimates were based in order to give exact absorption of overhead under normal conditions. Actual performance for the three months was recorded and adjusted in each case to the normal production which was assumed to be 4,000,000 pounds.

Rent.—The engineers, taking into consideration the type of building (Class A, B, or C construction) and the utility of the space for the purpose for which it was used, evaluated all space in the various buildings. If a department was in an inferior location, it received the benefit of the cheaper rent, but if it was in a better room than necessary, it was not penalized by a higher rent. All floor space was given a weight based upon a first class floor in a Class A building rating 100 per-cent. A square-foot rate, used to apply rent to departments, was obtained by dividing the total rent of all buildings by the total weighted area. The casting department accordingly was responsible for the weighted area of its floor space times this unit rate. Although in this space there were 33 furnaces of three types which varied slightly in size, the variation was considered small enough to be ignored. Since it was estimated that 30,000 furnace-hours would be required to produce the established normal production of 4,000,000 pounds, an hourly charge for rent was obtained by dividing the total rent cost by 30,000.

Power.—The actual coal consumption of the three types of furnaces was recorded during the test period. Since the production of this period was below normal, the fuel consumption was increased to represent the assumed normal production. The relative operating time of the types of furnaces was established by a study of past records. It was found that type C operated only about 25,000 hours to produce the normal production as against 27,500 hours for types A and B. By dividing the total cost of fuel consumed by each type of furnace by the number of hours it must operate to produce the normal production, a fuel-hour rate for each type was obtained which was added to the first element of rent.

Relining and Repairs.—Actual repairs for each type of furnace were analyzed over a period of six months, including the three months' test period. This figure, which was corrected to allow for normal production, was divided by the total number of hours necessary for each type of furnace in order to secure an hourly charge to be added to the elements already determined. It was found that type B furnace required 40 per cent more maintenance than type A, while type C required 20 per cent less than type A. The total relining and repair charges were apportioned accordingly.

Direct Labor.—Two factors entered into determination of direct labor; the average number of furnaces uesd during the period, and the average number of men per furnace, per shape poured. Actual analysis of the work produced during the three months' period appears below:

TABLE I

I	Flats and small billets-type A furnace.....	11,800 hours
II	Flats and small billets-type B furnace.....	400 hours
III	Extrusion-Large, type A furnace	1,800 hours
IV	Extrusion-Large, type B furnace	3,500 hours
V	Shells, type A	2,000 hours
VI	Rods, type C	2,500 hours
	Total	22,000

This total of 22,000 hours was corrected to 30,000 hours to obtain the normal production in order that the relationship between the various shapes, as indicated by the hours during which they occupied the furnaces during the test period, would be maintained.

By dividing the total hours of each shape—(corrected to the 30,000 hours total)—by the possible operating hours for one furnace, the average number of furnaces used per shape during the test period was obtained. This figure was the first factor required in determining direct labor.

The number of casters and moldmen required to pour each shape which was definitely known, was expressed as a relative. By multiplying the average number of furnaces poured during the period by the labor factor per furnace, a direct labor factor per furnace per shape was obtained. It should be noted that this new factor, although called the direct-labor factor, took into account the type of furnace, the shape, and the labor. Six of these factors were determined; which will be known hereafter as direct labor factors. The direct labor payroll for the test period was apportioned to the six furnace-hour rates according to the direct-labor factor. The indirect labor payroll was handled in the same manner.

Supplies.—Oil used in the molds, which was the only large item, was apportioned separately. Records were kept for three months' period showing the number of gallons used for the different kinds of molds. The total expenditure for oil was increased to cover normal production, and was apportioned among the six rates on a basis of the results of the actual observations for the three months' period. All other supplies were grouped and apportioned to the various rates on a basis of the direct-labor factor.

TABLE 2—OIL DISTRIBUTION

I and II Flats and small billets	77%
III and IV Extrusion	7%
V Shells	10%
VI Rods	6%

General Mill Expense.—This item, which included such accounts as works accounting, engineering, manager's office, employment, supplies, stores, and yard service, was distributed on the basis of the direct-labor factor after being increased to normal according to the judgment of the men in charge of the departments incurring the expense.

Maintenance and Repairs.—Analysis of past records showed the type C furnace to be directly responsible for 40 per cent of the cost of maintenance and repairs, because this type was operated at a higher temperature than the A or B. These costs were increased to provide for normal production and applied to the rate for C furnaces. The balance of the maintenance and repairs costs was spread over the rates, including the type C rates on the basis of the direct-labor factor.

Machine Depreciation.—The ratio of original cost of types A, B, and C furnaces was 1 to 2 to 6. The factor representing the relative number of hours each type of furnace would operate to produce normal production was multiplied by this factor of original value, in order to maintain a new factor on the basis of which the total amount of depreciation determined by the directors was apportioned to the various furnace-hour rates. This new addition to the rate took into consideration three elements: number of furnaces in use at a time; the original value; and total hours operated during the test period.

Metal Stores.—The metal stores department receives both old scrap and virgin metal, which it weighs into boxes or batches of the desired quantity. The output of the metal stores department is, therefore, measured by boxes. Since a mixture containing more ingredients requires more labor in weighing out the batches, the relation between the scale-man-hours and the furnace-hours for the different shapes was established during the test period by time studies. Inasmuch as the same shapes generally take the same mixtures, the number of scale-man-hours per shape for normal production was established. The total cost of metal stores was therefore distributed to shapes on that basis, divided by the normal furnace-hours per shape to give an hourly rate.

Cores—For Shell Casting Only.—Raw materials for cores were figured at standard rates. The total direct labor for the test period divided by the core production, minus a 5 per cent allowance for breakage, gave the direct labor cost per core. Six thousand cores were assumed to be a normal production for three months.

TABLE 3—TOTAL COST FOR TEST PERIOD OF VARIOUS FACTORS

Item	Amount	Basis of Distribution
Direct Labor	$19,300	Labor factor
Indirect Labor	8,300	Labor factor
Supplies Oil	2,000	See Table 2
Supplies, Other	7,000	Labor factor
General Mill Expense	14,000	Labor factor
Maintenance and Repairs	8,500	Labor factor
Depreciation	1,500	Furnace factor
Metal Stores	19,000	See Table 4

The total core room rent was divided by this figure, in order to secure a per core charge, which was added to the labor cost per core. Depreciation, power, light, heat, and other overhead charges in the core room, were reduced to a per-core basis. The total per-core cost was then transformed into an hourly charge by multiplying by the normal number of cores used per hour. This hourly charge was added to the furnace-hour rate for type A furnace when casting shells. This was the only rate affected by core charges.

TABLE 4

Item	I	II	III	IV	V	VI
Rent	$0.112	$0.112	$0.112	$0.112	$0.112	$0.112
Fuel	0.610	0.910	0.610	0.910	0.610	1.350
Relining and Repairing	0.125	0.175	0.125	0.175	0.125	1.100
Direct Labor	0.600	4.350	1.000	1.110	1.080	1.040
Indirect Labor	0.260	1.870	0.431	0.478	0.465	0.450
Supplies, Oil	0.126	0.126	0.026	0.026	0.100	0.048
Other	0.218	1.940	0.364	0.405	0.392	0.378
General Mill Expense	0.450	3.260	0.755	0.835	0.812	0.430
Maintenance and Repairs	0.265	1.910	0.490	0.442	0.475	0.468
Extra Repairs	0.	....	....	....	1.200	....
Depreciation	0.039	0.108	0.039	0.108	0.039	0.190
Metal Stores	0.590	0.590	0.790	0.790	0.590	2.560
Cores	....	....	....	....	0.185	....
Total	$3.395	$15.351	$4.694	$5.439	$4.985	$9.326

Company Credit to Employees

How the Mueller Brass Company Credit Union Has Worked

By F. A. WESTBROOK

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

"THE day after Thanksgiving my daughter was taken sick with scarlet fever and had to go to the hospital. On the second of January, I was taken sick with pneumonia and could not work until the fourth of April. I had a nurse eleven days; then my wife took sick and is still under the doctor's care. But as luck would have it, I am a member of the Mueller Credit Union, and I borrowed to pay the nurse, buy coal, and to tide myself over the emergency. I am now back at work and paying the Credit Union in small installments."

This was the recent experience of an employee of the Mueller Brass Company, of Port Huron, Mich.

Here is what happened to an employee of a plant where there was no credit union for him to turn to for help in just as unavoidable an emergency. He wanted to borrow $150.00. In his state there is a law which limits money lenders to a charge of 36% for loans less than $300.00. This law is intended to "protect" those who need to borrow small sums of money. However, when the employee in question called on the money lender for help, the latter offered to lend $301.00 which took the loan outside of the scope of the law. The employee signed a note for this amount and it called for an interest rate of 10% a month or 120% per year on $301. The lender then handed over $150.00 in cash, but the interest remained 10% a month on $301.00 and this rate was maintained even after payments on account of principal were made.

This kind of usury is very wide-spread among industrial workers, as many personnel managers doubtless know to their sorrow when they have to discharge good men because their wages have been attached. And yet everybody is likely to meet a combination of circumstances which makes it unavoidable for him to borrow money to tide over the emergency. The worst of it is that usually the emergency is so urgent and the man who needs financial assistance is so ignorant of what he should do and so perturbed, that he goes to the first place he can find. As a general thing this is a loan shark's office. They have a great way of locating their office right in the midst of a number of plants or as close as they can get to one employing a large number of workers. It has been said that "Usury is the normal result of a combination of two circumstances: an acute need of credit coupled with a complete breakdown of normal credit facilities."

Obviously a savings bank cannot make personal loans to wage earners because the law, of necessity, limits its investments to certain specified securities. Neither is the ordinary commercial bank equipped to make such small loans for the simple reason that it cannot operate on such a basis and make a profit. The credit union fills this very real need and it is a significant fact that there are many instances on record of where a loan shark's office has disappeared from the vicinity of a large plant a short time after a credit union has been established in it.

The question naturally arises, just what is a credit union? Briefly, it is a co-operative savings and loan association organized among a group of people such as the employees of the Mueller Brass Company. Thrift among the members is promoted and small loans are made to them for provident purposes. These loans may be in excess of a member's deposits. The laws of New York State governing credit unions are typical, whereby seven or more persons may obtain authorization to form a union and membership in it is secured by the purchase of one or more shares of a par value of from $1.00 to $25.00. A member has but one vote regardless of the number of shares he may hold and he cannot vote by proxy.

The management consists of a board of directors, a credit committee and a supervisory committee elected from the membership. No member may serve on both the credit and supervisory committee. The only salaried executive is the secretary-treasurer. This, together with the fact the cost of credit investigations among the members, who are all well known to each other, amounts to little or nothing, makes for a very small operating expense. Generally loans of $50.00 or less are made on the borrower's unsecured promissory note. Larger sums must have an endorsement and sometimes other security. The interest rate is limited in New York to 1% per month simple interest and is sometimes lower, approximating the rates on commercial loans. In addition to this, 4% to 5% is paid on deposits and 6% or better in dividends. It is a fact that the number of uncollectable loans is very small, because in a community organization of this kind each member is usually fairly well acquainted with the other members. Each is a stockholder and often a depositor and borrower at the same time, and he realizes that one who fails to meet his obligations defrauds not only his fellow members but himself as well, and will also bring down upon his head the condemnation of his associates.

The Mueller Credit Union was organized three years ago with less than $20.00. Now it has $1,000.00 in assets for every dollar it started with and it is able to make individual loans up to $500.00. That it is filling a real need is shown by the fact that in a year and a half it made four hundred loans to one hundred and forty-two members. And that it is a well conducted business is further shown by these loans being made at 7%, while 4½% interest is paid on deposits and 8% dividends on shares. It also has a Christmas and Vacation Club. Money may be withdrawn by depositors at any time.

The following figures give a still better idea of the operation of this credit union:

	Dec. 31, 1926	Nov. 1, 1928
Assets	$8,690.00	$21,063.00
Members	238	289
Borrowers	61	119
Loans outstanding	$2,619.00	$7,380.00
Bond investments	$2,940.00	$7,419.00

An interesting feature of credit unions is that they work just as well in a small group as in a large one. For instance, the Utah Copper Company has several times as many employees, and such a far flung organization as the New England Telephone & Telegraph Company has an elaborate system of credit unions whereby all of its employees may benefit.

The credit union movement in this country has been fostered by the Credit Union National Extension Bureau, 5 Park Square, Boston, Mass., which is very active and only too glad to assist any group, anywhere, in starting. It is financed by Edward A. Filene of Boston as a disinterested public service.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

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Editorial

Why the Platers' Society Grows

THE American Electroplaters' Society held its seventeenth annual convention in Detroit, July 8-11 and over seven hundred people registered—a greater number than ever before in the history of the Society. Visitors and members came from the Pacific Coast, from Canada and from Florida. There were electroplaters, manufacturers, chemists, metallurgists, operating foremen and superintendents, research workers, students and teachers. Why is there such widespread interest in an organization originally started by men who were classed as skilled workers, and in many cases the word skilled included quotation marks and a question?

Any visitor at the convention could tell without difficulty. There were authoritative papers on metal cleaning, brass plating, cadmium, chromium, nickel, metal, finishing, spotting out, plating on non-metallics and solution analysis. There was free and unrestricted discussion, there were visits to great production plants of Detroit, there were prizes for the best papers and for the best exhibits of plated and finished work. Hard-headed and hard-handed foremen discussed their problems with college professors. Theory and practice joined hands with a common object, to improve American plating practice. The motto of the American Electroplaters' Society is "Knowledge is Power." The practical plater learns theory from the chemist and research worker; the laboratory man learns practical plating from the man at the tanks. The result is that both gain immeasurably.

The progressive plater no longer sneers at theory but learns it and adapts it to his work. The intelligent chemist no longer looks down upon a man with soiled overalls but takes his advice on the results in the shop. There is no leader and follower here; they are all workers together. The Bureau of Standards, one of the great research institutions of the world works hand in glove with the formerly "uneducated" man of the shop.

And that is the reason for the growth and strength of the American Electroplaters' Society. There is co-operation in every department of the industry, which includes the salesmen of plating equipment and supplies who realize that their future as a class is tied up with improvement of the industry, and that their future as individuals depends upon their honesty, ability and knowledge of their field.

The future of electroplating was never so bright as it is to-day.

Information for Shop Problems

TO give a correct answer to the many types of questions which we receive on the plating and finishing of metals requires careful thought and wide experience. Some of the questions give very little data and it is almost impossible to answer them with any assurance that the answer will be of use to the inquirer. Consequently, in some cases, there may be unwarranted dissatisfaction with one who has sincerely given his best efforts to help those who need his aid.

For that reason we ask of our readers that they follow closely the following instructions when asking questions on plating, and polishing work.

In sending solutions for analysis, be sure to fill the tank with water to the solution level, stir the tank thoroughly and take a two- or three-ounce sample of the stirred solution in a clean bottle. Cork the bottle tightly, label it with the sender's name and address and mail it to THE METAL INDUSTRY, 99 John Street, New York, N. Y., marking the package plainly with the words "Chemical Solution." The sample should be packed carefully to avoid breakage in transit.

When chromium plating solutions are sent, a rubber or glass stopper should be used in the bottle. A convenient way of packing the sample is to use a mailing tube which can be obtained in any post office.

The letter can be sent under separate cover giving the following information:

1. Original formula used for the solution.
2. Describe the trouble clearly.
3. Temperature at which bath is operated.
4. Voltage and amperage used.
5. Kind of anodes used.
6. Volume of solution (tank capacity in gallons).

Also send a small piece of the work that has been plated and that clearly shows the trouble.

If the question refers to a certain finish that is wanted, send a sample, if possible, as the finish may be known by several names. This is particularly true of the bronze finishes.

In asking for formulae for plating and finishing be sure to state the composition of the base metal that is to be plated or finished.

If those who ask for help, will follow the above suggestions, we are sure that our associate editors will be in a position to give replies, satisfactory in every respect.

Increased American Zinc Production

THE world has produced over 37,000,000 tons of zinc since the year 1800. For a metal so little in the public eye, this is a remarkable record especially when it is noted that the copper output during the same period totalled about 40,000,000 tons.

An economic study by the Bureau of Mines points out a number of interesting facts about the production of zinc. Zinc was originally an impurity, but after the time of Augustus Caesar was intentionally added, since the Romans had discovered that by melting certain ores together, a yellow alloy could be obtained with good properties and a golden color. Zinc was mined to a small extent in the middle ages for brass and it was by the Dutch merchants who brought it in from China that it was given the name "spialter" from which our word spelter descended. Paracelsus, the alchemist, in the 16th century was the first to mention zinc as a metal. It was not until about 1740 that zinc was extracted as a metal by distillation in crucibles, and not until about 1807 at Liege, Belgium, that large zinc distilling retort furnaces were employed. It was here that the modern zinc smelting industry began.

The production of zinc grew rapidly during the 19th century and then even more, during the first ten years of the 20th century. Production reacted during the World War and then again in 1921, due to the post war slump. Recovery followed and in 1927 almost 1,500,000 tons were produced—the highest recorded output.

During the first half of the 19th century, all the zinc was smelted in Europe. These same smelters have produced 60 per cent of the world's output of over 37,000,000 tons in the period from 1801 to 1927. North

America furnished 32 per cent, leaving 1 per cent to be divided between Australia and Asia. In 1927, however, Europe produced 48 per cent of the world's zinc and North America 47 per cent, leaving 4 per cent to Australia and 1 per cent to Asia. In the 19th century, Germany ranked first as the producer of zinc with Belgium second and the United States, third. In the 20th century the United States was the leading producer, with Belgium and Germany as taking turns at holding second place. Poland is now ranked third because of her important zinc territories acquired from Germany as a result of the war. The American industry was always certain to take the lead eventually because of its enormous zinc ore deposits. We now have a production of about 600,000 tons per year, in round numbers amounting to about $75,000,000 to $80,000,000 in value.

Zinc is the basis of a great industry and it is to be hoped that those engaged in it will be able to control it and keep it stable.

Reviving an Industry

EVERYONE engaged in working with or for copper and copper alloys, has been aware of the remarkable rise in the copper industry. Some of us knew about the effective work done co-operatively through the Copper and Brass Research Association. But a summary by George A. Sloan, now secretary of the Cotton-Textile Institute, but formerly secretary of the Copper and Brass Research Association, brings back to mind in sharp relief, the extraordinary revival of this basic commodity.

Three years after the armistice was signed, we had in the United States, a stock of 1,125,000,000 pounds of copper of which 600,000,000 pounds consisted of surplus war stock. Consumption had fallen to new low levels and production capacity had been enormously increased due to war demands. The task was to find commercial peacetime outlets as quickly as possible without disrupting American industry.

The first thing to do was to get the facts. The American Bureau of Metal Statistics was in a position to supply statistics of production, stocks and shipments as well as consumption. The second step was the formation of the Copper and Brass Research Association in 1921, to promote domestic markets through technical and commercial research, co-operation with dealers and national advertising.

While it is impossible to credit everything to one or another agency, the results are nevertheless illuminating. During the life of the Association, the annual domestic consumption of copper in the United States rose from 920,000,000 pounds in 1921 to 2,000,000,000 in 1928. Specific examples showing the reasons for this increase can be cited. The consumption of copper in brass pipe rose from 16,000,000 pounds in 1922 to 75,000,000 pounds in 1928. In order to make permanent such increases, advertising has been organized by large fabricators to make familiar to the general public, their names as individuals. Anaconda, American Brass, Chase, Republic, Bridgeport, Scovill and others now have fame which is more than merely local or confined to their trade. Mergers, both vertical and horizontal, have cemented units into strong groups.

While this was going on, the metal producers were lowering their costs; the same applies to fabricators although in a somewhat lesser degree. The progress of the copper industry during the past eight years is an object lesson to every other branch of endeavor. Those who are in trouble now can make immediate use of it; those who are not should bear it in mind to ward off the blows of fate in the future.

The Bonus System

THE bonus has risen in popularity throughout manufacturing plants, particularly in the metal trades. It is safe to say that most progressive plants have some sort of incentive for their operatives.

It is important in installing such a system to be fully aware of its dangers and pitfalls as of its benefits. Extra pay for extra work sounds simple and effective, but it may be a two-edged sword. For example, it may speed up the worker to a point where the quality of his output deteriorates. This is one of the commonest diseases of the bonus system. Another evil is the fact that inevitably some jobs will pay the men better than others, as it is impossible to estimate perfectly on all jobs and later revisions are always unpopular. Consequently there will be trouble and perpetual friction among the men unless the situation is skilfully handled by the men in charge of distributing the work.

Another difficulty is the effect of bonus jobs upon straight day-work. It is often impossible to place every job in a shop on a bonus basis; some classes of work have to be done by the day rate. It is rarely that a worker changes from the bonus system to straight day's pay without a sharp let-down in production.

There are often jobs which are put in the hands of several men working together. Individual bonuses cannot be figured, consequently bonuses are calculated on a group basis. Here is fresh fuel for disagreements as some men are by nature faster and cleverer than others, and unless they are very forbearing, will complain about being held back by their slower partners.

There is no infallible system or sure cure. A bonus system must have as its chief ingredient a large proportion of common sense. General experience has shown, however, that given a sound method and a desire on both sides to be fair, bonus systems are successful in increasing output, raising the workers' earnings and lowering costs.

At War With the World

WE are used to queer communications because editors are peculiarly subject to the whims and opinions of a wide variety of readers. We must admit, however, that we were jolted by a hand-written note scribbled on the bottom of one of our subscription expiration notices, which read as follows:

Dear Sir: I will not renew my sub. because there is a nation-wide movement among Large Employers to keep the wages of Foremen down, regardless of how good they are. This will eventually drive me out of the Foundry business and further knowledge of foundries will be of no value to me. I should like to have your editorial comment on this very demoralizing idea.

Respectfully,
SUBSCRIBER

Needless to say, letters of this sort come only from anonymous writers. Under the circumstances, we are in perfect agreement with our ex-subscriber on two points:

1. Further knowledge of foundries will be of no value to him.

2. His is a very demoralizing idea.

Our experience, gained from acquaintance with a large number of foundrymen, is as follows:

1. There is no nation-wide movement or any other kind of a movement to keep down the wages of good foremen.

2. There is a world-wide movement to keep down the wages of poor workers regardless of whether they are in the foundry business or any other line of endeavor.

3. Anyone who finds knowledge of no value is sure to find his wages kept down.

Correspondence and Discussion

Anode Distance and Voltage

To the Editor of THE METAL INDUSTRY:

In noting Mr. F. M. Dorsey's and Mr. Sizelove's comments on anode distance, in your July, 1929 issue, on page 342, I quite agree with Mr. Sizelove's statement that "it would be far better, I believe, to refer to anode and cathode density and disregard the voltage, to a certain extent as better results would be obtained." But I will go further and state that the reading of the ammeter, alone, under variable load conditions and under variable surface contour conditions is not practical.

Anode and cathode distances are very important. In depositing metal upon a straight flat surface, distances between anode and cathode are of no importance. Just as long as it is known how many amperes are required to deposit satisfactorily upon a given number of pieces in a specified time, anode-cathode distances are unimportant and it makes no difference from the plater's point of view whether the voltage required is six or one and a half. But how many platers have such surfaces at all times and how many can deposit upon the same surface area at each and every load? There are, perhaps, a few.

In practice it is usually the case that the surfaces are uneven; there are high spots and undercut spots, oval and round pieces and angular pieces, all being plated at the same time. Here, then is the importance of anode-cathode distance and the importance of reading voltage only under variable load.

The number of amperes conducted through the solution for such a load could be determined only by repeated trials to determine the current density for best results. If the voltage is noted for the load having the best deposit, then that voltage will be approximately correct for a larger or smaller load regardless of the number of amperes going through. Here, then, under this condition, the current density is, while important, not applicable since the surface area is unknown.

In depositing upon uneven surfaces, every solution has a specific resistance and a specific conductivity. There must be voltage high enough to overcome the specific resistance and break up the molecules of the solution. If a nickel solution has a resistance of eighteen ohms per cubic inch, and the anode-cathode distance on the high portion of the surface is six inches, then the total resistance between anode and cathode at that point would be 108 ohms. If there is a surface undercut to the depth of 3 inches (which is very often the case in large pieces pressed to shape such as burial caskets) then we have $18 \times 9 = 162$ ohms total resistance in the solution between the anode and the undercut surface being plated. As this additional resistance must be overcome by an increase in voltage before any deposit may be had on the undercut surface, it follows that the current density on the high spots will be increased. In fact the high spots will receive all the deposit until the solution between the anode and high spots and directly in the path of the current becomes saturated with current; or in other words, the maximum specific conductivity at a given voltage has been reached, when the overflow of current travels to the undercut surface and deposits metal there.

Here, then, anode-cathode distance is important. Since we have shown that the current can not reach the undercut surface until the solution around the high spots has reached its limit of conductivity, we know, as platers, that the high spots will become "burned." Increasing the anode-cathode distance will remedy it. We will increase the total resistance between all points, to be sure, but in increasing the distance between anode and cathode we do not raise the specific resistance, which is fixed, but we decrease the ratio of total resistance between the anode and undercut surface and consequently get a more even distribution of current over the whole piece. Such a method reacts about the same as flattening out the piece. It does not require any knowledge of higher mathematics to calculate these ratios and ascertain the truth.

Again, voltage only is important when plating under such conditions.

Springfield, Ohio.
July 15, 1929

E. S. THOMPSON, Foreman,
Metallic Caskets Plating Department,
SPRINGFIELD METALLIC CASKET COMPANY.

Black on Brass

To the Editor of THE METAL INDUSTRY:

I noticed Problem 3,863 for Black on Brass, I wish to state that I have had very good success with the following method.

One must see that the articles are absolutely clean with a good grade of metal cleaner. The cleaner cannot be too strong with potash, etc., or it will tarnish the brass. In other words a mild cleaner should be used.

After cleaning wash the articles in cold running water, and then in very hot water. By placing the articles in a regular basket for the purpose and swinging it around a little it will move the articles and in this manner, it will clean quite a bunch and clean them quite evenly. Now immerse the articles in

Muriatic acid	1 gal.
Arsenic oxide	6 ozs.
Oxide of Iron	2 ozs.

This solution will work either hot or cold, give a nice black and can be buffed clean for relief finish.

Lacquer with a good grade of lacquer.

Coldwater, Mich.,
July 15, 1929.

ANDREW V. RE.

New Books

Annual Proceedings of the American Society for Testing Materials for 1928; in two volumes. Published by the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Volume 1, 1184 pages; volume 2, 904 pages. Price, $6.00 each in paper; $6.50 each in cloth; $8.00, each in half-leather binding.

Part one contains the annual reports of forty-two standing and research committees and three joint committees. Among these reports are those on non-ferrous metals and the effect of temperature on the properties of metals. A large number of tentative standards have been revised and are published for the first time.

Part two contains forty-six technical papers with discussions containing information on the results of investigations into such subjects as transoceanic telephony; the fatigue of metals, effect of temperature, corrosion fatigue, etc.

Practical Japanning and Enameling. By William J. Miskella. Published by the Finishing Research Laboratories. Size 6 x 9, 250 pages. Price, $3.50.

This volume covers baked finishing from the practical standpoint. It gives the baking methods of applying japans and enamels to metals, covering the present uses, and pointing out other fields of possible application. The book includes a number of color plates, tables and illustrations. Special subjects covered in the various chapters are as follows: Raw Ma-

terials; Japans and Enamels; Reducers; Fillers; Baking Varnishes; Shop-Cleaning Equipment; Sand-Blast Equipment and Its Operation; Preparing the Surface; Spray Methods of Application; Other Application Methods; Oven Design; Gas-Burners; Accessory Equipment; Hazards; Lithographing; Water Japan; Mechanical Decoration; Silk Screen Stencil Process.

Zinc **Worker's Manual.** Published by the American Zinc Institute, 27 Cedar Street, New York. Size 9 x 11, 112 pages. Price, $1.50.

The experience has been compiled of the members of the American Zinc Institute and their associate experts on the methods of working sheet zinc. Most of the applications are, of course, for building purposes, but the principles apply to any sort of zinc sheet work. Special chapters cover roofing (Batten style, and standing seam), shingles, diamond tile, leaders and gutters and corrugated sheet zinc.

A number of appendices give tables and data on methods of calculations, estimating sizes and weights, geometric formulae, etc.

A Bibliography of Metallic Corrosion. By W. H. J. Vernon. Published by Longmans, Green and Company. Size 5 x 8, 341 pages. Price, $8.40.

The tremendous interest in corrosion has prompted this complete list of references to papers on ferrous and non-ferrous corrosion, including methods of protection, published up to the end of 1927. It has been greatly enlarged from a bibliography prepared for the British Non-Ferrous Metals Research Association, and privately issued to its members. It is written in dictionary form, simply giving references and a few lines for each reference to show the investigator whether it will be of interest to him or not.

The book includes: Various Types of Corrosion; Factors Influencing Corrosion; Corroding Media; the Metal, Alloy or Manufactured Articles Undergoing or Resisting Corrosion; Methods of Protection.

Practical **Railway Painting and Lacquering.** By H. Hengeveld, C. P. Disney, William J. Miskella. Published by Finishing Research Laboratories, Inc., Chicago. Size 6 x 9, 242 pages. Price, $3.50.

Here we have another practical handbook, this time especially for railway men such as master painters, mechanical engineers, division engineers, maintenance men, etc. It gives considerable general information on methods and processes, describes the painting and lacquering of locomotives, freight and passenger cars, signal equipment, bridges, buildings, water service, and electric railway cars. It carries 164 illustrations.

Public Schools and the Worker in New York. Published by the National Industrial Conference Board, 247 Park Avenue, New York. Size 6 x 9, 80 pages. Price, $1.50.

The Conference Board has made a survey of public educational opportunities for industrial workers in New York State, describing general opportunities; vocational training; industrial surveys, and industrial training in New York compared with other states.

Journal of British Institute of Metals Volume 40. Published by the Institute of Metals, 36 Victoria Street, Westminster, London, S. W. 1, England. Size 5 x 8, 889 pages. Price, 31s/6d.

The appearance of the 40th volume of this journal coincides with the 21st birthday of the Institute. The first part of the book includes the fifteen papers read at the recent Liverpool meeting. The second section has a summary of engineering and metallurgical literature, published in the scientific and technical press throughout the world during the past six months. Rapid reference to this vast mass of material is facilitated by a complete index of 10,000 entries.

The fifteen papers were published in abstract in THE METAL INDUSTRY for October, 1928.

Year Book of the American Bureau of Metal Statistics. Published by the American Bureau of Metal Statistics, N. Y. Price $2.00.

This is the 9th annual issue of the now standard book of statistical information published by this Bureau. Statistics are given on production, stocks, operating details, consumption, imports and exports of copper, zinc, lead, gold, silver and miscellaneous metals.

Standards Year Book for 1929. Compiled by the National Bureau of Standards. Size 5½ x 9, 400 pages. Price, $1.00. Obtainable from the Superintendent of Documents, Washington, D. C.

The Standards Year Book is now a fixture. This is the third issue of the volume which has proved indispensable to all interested in any phase of standardization in America and abroad. It is a reference book summarizing and bringing up to date current standardization activities and accomplishment.

Its chapters cover: Commercial Weights and Measures; International Agencies; National Agencies; Federal Agencies; Municipal, County and State Agencies; Activities of Technical Societies and Trade Associations, and a Bibliography.

Metal Statistics. Published by the American Metal Market. Size 4 x 6, 568 pages. Price, $2.00.

A number of new tables have been introduced in this twenty-second annual edition of the book containing statistical information on iron, steel and metals. Price quotations are included; also production statistics on the various metals and fabricated metal products.

Metal Crafts in Architecture. By Gerald K. Geerlings. Published by Charles Scribner's Sons. Size 9 x 12, 202 pages. Price, $7.50.

The author has written a book—primarily for the architect and designer, but it is also of unusual interest to the metal manufacturer supplying the building trades. He discusses bronze, brass, cast iron, copper, lead, tin, lighting fixtures, design, etc.—in other words all metals and their products used in buildings.

Most chapters are divided into three parts: history, craftsmanship and illustrations. Under craftsmanship is included methods of laying out the work, casting and finishing. The author is thoroughly familiar with this field in which he has been engaged for many years.

The book is to be recommended to those in any way related to the building trades, not only for its practical value, but for its artistic and cultural worth.

Technical Papers

Barrel Burnishing of Metal Products, by H. Leroy Beaver, Philadelphia, Pa. Reprint in pamphlet form of a paper that was read at the annual meeting of the Philadelphia Branch of the American Electroplaters' Society and which also appeared in the March issue of THE METAL INDUSTRY. A valuable contribution to the literature on the subject of burnishing.

Chromium Plate and Its Processing, by A. D. Richardson, plant engineer, National Chromium Corporation, 200 Varick Street, New York City. An article reprinted from "Pencil Points" and giving details for specification of chromium plate by architects and specification writers not fully familiar with chromium. A number of points are brought out which should be highly interesting to electroplaters who are working chromium solutions and also to those who operate any sort of solution.

Reflecting Power of Beryllium, Chromium and Several Other Metals, by W. W. Coblentz, physicist, and R. Stair, junior physicist, United States Bureau of Standards, Washington, D. C. Obtainable for 10 cents from the Superintendent of Documents, Government Printing Office. Research paper No. 39, presenting data on ultra-violet reflecting power of several metals.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Black on Brass

Q.—Can you advise me how I can tell when the copper cyanide solution is short of cyanide? By the effect of the anodes and of the work when it comes out of the solution?

I have also quite a number of small pieces of assorted metal, that have to be finished to compare with a black lacquer finish. I well appreciate it very much if you will send me a solution that can be used without current. It must be a jet black to compare with black lacquer.

A.—A low free cyanide content of a cyanide copper solution is indicated by the anodes coating over with a green copper compound; also by the work plating streaky. The sure way to determine the free cyanide would be by making an analysis of solution. Send us a 2 oz. bottle of the solution and we will analyze it for you.

If the small pieces are made of brass, use either of the following solutions. If they are not of brass, then brass plate before using the dip.

Carbonate copper	16 oz.
Ammonium hydroxide	64 oz.
Water	1 gallon

Add the water after the ammonium hydroxide and copper carbonate have been thoroughly mixed. Use at a temperature of 175° F. There must be an excess of the carbonate of copper or results will be poor. Arsenic black.

Yellow Arsenic	2 oz.
Sodium cyanide	8 oz.
Ammonium hydroxide	4 oz.
Water	1 gallon

Use solution near boiling point.

—O. J. S., Problem 3,872.

Gold on Tin

Q.—We are making a line of cheap jewelry (pins, links, buttons, etc.) which we electro-gold plate. This work is plated in baskets to stand the acid test 25 or 30 seconds.

We plate directly on brass. We understand, however, that others in the same line tin plate before gold plating. This is what we desire to do as we find we can obtain the required acid resisting qualities with much less gold.

However, we are unable to produce a bright 14 kt. finish on a tin plated surface with the solutions that we use owing presumably to the amount of cyanide necessary in our solutions (about 1½ ozs per gallon) which scums the tin plate.

Could you furnish us with a formula for a 14 kt. gold solution, for basket work, that will plate bright and even on a tin plated surface? Also what in your opinion is the best method of tin plating this class of work?

A.—Do not believe that you will be able to produce your work any cheaper by tin plating before gold plating. It will be necessary to use more gold to produce desired color on a white surface than on brass and with the same amount of gold deposited on either a brass or tin surface the acid resistance qualities would seem to be the same.

Would suggest that you use the following tin solution as the deposit is bright and this will eliminate the cloudy appearance that you mention:

Stannous chloride ¼ oz.
Sodium cyanide 1 oz.
Water 1 gallon

Use warm and as a flash only.

Your present gold solution will no doubt work well on a bright deposit.

—O. J. S., Problem 3,873.

Hot Nickel Solution

Q.—We are interested in using a hot nickel bath. Can you tell us what we should use for a solution, tank lining and steam coil with which to heat the solution?

A.—In the great automobile plants in the Middle West lead-lined tanks and lead steam coils are used. The lead lining should have all seams burnt in. Nickel solutions have no reducing action upon the lead. Even if the free acid did, the lead sulphate reduced would not deposit out; it would become inert and go to the bottom of the tank.

For warm nickel solutions operated at 110 to 120° Fahr. the following formula gives excellent results:

Water	1 gal.
Single nickel salts	32 ozs.
Nickel chloride	3 ozs.
Boric acid	4 ozs.

Anodes soft rolled, 99% plus; voltage, still solutions 6, mechanical conveyors, 8 to 10 volts, depending upon the amperage. The minimum for the alive type of solution is 25 and may run up to 50 amps per square foot.

Warm nickel solution should be built up with single nickel salts and nickel chloride upon the basis of 3 parts single salts and 1 part nickel chloride as may be required to maintain the metal concentration. Even more nickel chloride may be required to maintain the high rate of anode reduction necessary when depositing nickel at high current densities. The pH. will have to be determined; about 5.8 should be satisfactory.

—C. H. P., Problem 3,874.

Nickel on Brass

Q.—Will you kindly give me information on the following questions: Articles made of sheet brass are polished then racked up and sent to nickel room. First work is immersed in a cleaning solution for about two minutes, then rinsed in hot water, then electric cleaned and rinsed in cold water; then in cyanide dip and rinsed in cold water and is ready for nickel tanks. The work looks perfectly clean but the ends of work seems to be stripped.

The following bright acid dip which I tried to use in place of cyanide dip seems to pit the polished brass:

2 parts sulphuric acid 66° Baumé.
1 part nitric acid 36° Baumé.
1 part water.
1 tablespoon of salt to each gallon.

This solution tested 50° Baumé and pits the work. I added water and brought test to 25° Baumé, and this turns work cloudy. Can you give me a good acid dip for polished work that will not pit or turn work cloudy.

I have two nickel tanks, one 300 gallon and one 100 gallon, and use 2 volts for plating. Is it possible that the right amperage is not going to these tanks? What is the proper amperage per square foot of work? The rheostats on these tanks are of the circular type and iron wire coils are used.

The first two coils are made of wire .093 dia., 11 coils 1¼ dia.; second coils .120 dia., 12 coils 1¼ dia.; third coils 1.40 dia., 13 coils 1¼ dia.

Is there any wire chart to tell just what size resistant wire to use to get the right amperage?

A.—We do not believe that your usual cleansing methods have anything to do with your nickel plating problems. The cleansing of the polished brass first in a mild cleaner for two minutes should in itself cleanse the product sufficiently, if after the cleansing a cyanide dip is used to remove any superficial oxidation from the cleansed brass articles that develops in the cleansing. A cyanide dip—water 1 gallon, sodium cyanide 4 ozs., should be of ample strength to remove the oxide.

You mention that you use an electro cleaner as a further aid in producing a chemically clean surface; then you rinse in water and cyanide dip. Apparently from your statements your problem still continues. You have also immersed the articles after all this cleansing in a regular bright acid dip.

2 parts sulphuric acid.
1 part nitric acid.
1 part water.
1 tablespoonful of salt per gallon of mixed acids.

Frankly, it seems likely that your nickel solutions are at fault and that the peeling of the nickel deposit is due to an unbalanced solution. All the acid dips that we might advocate to you in connection with your cleansing operations will not correct an unbalanced nickel solution. We should infer that hydrogen occlusion is the cause of your peeling problem. Add a 25% (volume) hydrogen peroxide solution. You may add ⅛ oz. to ¼ oz. per gallon of nickel solution and your problem should then be overcome.

It would be advisable to have an analysis made of your nickel solutions.

Two volts is too low an electro motive force; 3 to 4 would be normal; then up to 10 amperes per square foot of surface area could be carried with more efficient results, providing your nickel solution contains sufficient metal. —C. H. P., Problem 3,875.

Nickel and Silver Solutions

Q.—We are sending under separate cover one bottle nickel solution and one bottle silver solution. The silver solution seems to be working all right but we do not seem to be able to keep the current down and our plating room foreman believes it is too high in cyanide.

The nickel when used at a room temperature peels when chromium is applied but seems to work better at a temperature of 110° F.

A.—Analysis of silver solution:

Metalic silver .75 oz.
Free cyanide 3.32 oz.
Sodium carbonate 7.86 oz.

Solution is low in silver and high in free cyanide with this amount of metal. The carbonate content, while high, is not the cause of the trouble.

Would suggest the addition to the solution 1 oz. of sodium cyanide and 2 oz. silver cyanide to each gallon of solution.

Analysis of nickel solution:

Metallic nickel 2.61 oz.
Chloride as ammonium chloride 1.98 oz.
pH. 5.8

Nickel solution is in good condition with the exception of the pH.

Raise the pH. to 6.0 by adding ½ cubic centimeter of 26° ammonium hydroxide to each gallon of solution. Use solution at a temperature of 100° to 110° F.—O. J. S., Problem 3,876.

Poor Nickel Solution

Q.—We are sending you a nickel solution which we would like you to analyze. This solution works black with streaks and when it is brushed it comes off. It does not deposit very well.

We are sending you a piece of merchandise showing just how it looks and you can see for yourself just what is wrong.

A.—Analysis of nickel solution:

Metallic nickel	2.04 oz.
Chloride as ammonium chloride	.35 oz.
pH.	5.2 oz.

The metal content is all right but the other constituents are poor. There is practically no chloride and the acidity is entirely too high.

There has also been introduced into the solution a small amount of zinc, either through carelessness or from impure salts or through the use of zinc anodes which have been mistaken for nickel ones, and this is the cause of the black streaks on the work.

The solution is in such a poor condition that I would advise making a new one, in preference to correcting trouble.

Use the following formula:

Double nickel salts	8 oz.
Single nickel salts	4 oz.
Sodium chloride	2 oz.
Boric acid	2 oz.
Water	1 gal.

—C. H. P., Problem 3,877.

Removing Grease

Q.—What is the best way to remove from the cracks and corners of cheese hoops, grease, which is often very thick. Heretofore we have been soaking them in boiling lye water, and then brushing them by hand with a steel brush. These cheese hoops have been used for some 2 or 3 years and naturally the creases and corners are filled with this grease, or in other words cheese.

A.—The method you are now using is about as satisfactory as you can follow for your purpose. A solution prepared from

Water	1 gallon
Caustic Potash	2 to 4 ozs.
Soda Ash 58%	1 to 2 ozs.

heated to 200° F. would be more effective than an ordinary lye solution which means a caustic soda solution.

It would be possible to remove the grease or cheese from the hoops by immersion in a high flash test kerosene oil.

It can be heated by steam coils, the evaporation being very slight, up to 160° F.

If this material is used then a very short immersion in the cleanser mentioned will give you a clean hoop.—C. H. P., Problem 3,878.

Semi-Lustre Dip

Q.—We are seeking a substitute for baking soda for cleaning the discoloration or coating off work from our hot gold solution.

We have used slaked lime and cyanide but it does not leave work as bright.

We assure you that we will appreciate any suggestion you can make.

A.—We do not believe you will find a material as satisfactory as bicarbonate of soda for rubbing down your gold plated product to a semi-lustre finish. Bicarbonate of soda is baking soda. When purchased in barrel quantities it is not costly; purchase the material under its correct chemical name as given.

You might try magnesium carbonate to replace the bicarbonate of soda but we do not believe you will obtain as good results.

—C. H. P., Problem 3,879.

Statuary Bronze on Brass

Q.—We take the liberty of asking you if you will be good enough to advise us how we can obtain a statuary bronze finish on brass casting like sample piece enclosed herewith.

A.—To produce an antique finish upon cast brass equal to small sample piece submitted, the surface, after roughing out with No. 100 emery wheel, must be sand blasted. After sand blasting then dip them in an antique dip prepared as follows:

Water	1 gallon
Hyposulphite of soda	4 to 8 ozs.
Lead acetate	1 to 2 ozs.
Liver of sulphur or polysulphide	⅛ to ¼ oz.

Heat the solution up to 180° to 200° Fah., then immerse the sand blasted castings in the dip until they become a gray black; then remove them, wash and dry them; then brush the surface down to show the brass with either a bristle brush or steel wire scratch brush and a little pumice stone mixed with water.

Finally lacquer the articles to protect the finish.

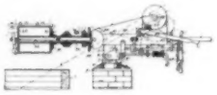
—C. H. P., Problem 3,880.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,713,232. May 14, 1929. **Galvanizing Mechanism.** Patrick J. Kelley, Mansfield, Ohio, assignor to The Ohio Brass Company, Mansfield, Ohio.



An apparatus for use in coating articles comprising a tank of coating material, a mounted frame, a rotatable container mounted on the frame, means permitting the frame to pivot in a vertical plane and dip into the tank, means to rotate the container while in and out of the tank and means to open the container at will from a point remote from the container.

1,713,233. May 14, 1929. **Coating Process.** Patrick J. Kelley, Mansfield, Ohio, assignor to The Ohio Brass Company, Mansfield, Ohio.

The method of coating articles with metal comprising the placing of the articles loosely in a container with a dry flux, then rotating the container and tumbling the articles therein to distribute the flux over the articles, then submerging the still rotating articles in a hot bath of coating-material and roating the articles and flux within the bath until the articles are coated and then removing while still rotating from the bath and removing the surplus coating metal by continued rotation.

1,713,312. May 14, 1929. **Die Casting Machine.** Walter O. Will and Eric Carlson, Chicago, Ill., assignors to Stewart Manufacturing Corporation, Chicago, Ill.

In a machine for the purpose indicated having a die-member-carrying head, a core-carrying plate mounted for reciprocation with respect to said head; secondary rack bars constituting carrying stems for said plate mounted for guidance in said head; gear pinions journaled in the head for co-operating with said rack bars for reciprocating the latter and said plate; a primary rack bar mounted for reciprocation in the head, engaging said pinions for actuating the same; and actuating means for said primary rack bar for reciprocating the same relatively to the head.

1,713,514. May 21, 1929. **Process of Electrolytically Separating Metallic Chromium for the Production of Chromium Coatings on Other Metals.** Rudolf Appel, Berlin, Germany.

A process for depositing chromium on other metals which comprises subjecting the metallic object to be coated to electrolysis in a chromic acid bath containing not more than 0.5 gram of sodium iodate per litre of bath liquid.

1,713,677. May 21, 1929. **Process of Soldering and Product Thereof.** Karl Schumpelt, Pforzheim, Germany, assignor to Ernst Gideon Bek, Pforzheim, Germany.

Process of soldering articles which consists in bringing the surfaces to be soldered together, depositing thereon, without the use of external electric current, such an amount of solder capable of being absorbed by the metal of the article, during the subsequent heating operation without substantially changing the color of the article, and finally heating the solder to cause it to melt and to be absorbed by the metal of the article

1,714,445. May 21, 1929. **Soldering and Welding Medium for Aluminum.** Wilhelm Reuss, Mannheim, Germany.

A soldering or welding medium comprising a mixture of 10 parts of borax, 10 parts of boracic acid, and 10 parts of caustic potash, dissolved in water, with an addition of 15 parts of common salt and 1 part of sulphuric acid of 66° Bé. dissolved in water.

17,309. (Reissue.) May 28, 1929. **Treatment of Magnesium and Magnesium Alloys to Inhibit Corrosion.** Arthur C. Zimmerman, Dayton, Ohio, assignor to The Dow Chemical Company, Midland, Mich.

The method of treating magnesium and magnesium base alloys to inhibit corrosion, comprising treating the metal with a solution of not more than five per cent phosphoric acid, containing from one-tenth to ten ounces manganese dioxide per gallon of solution for about one and one-half hours.

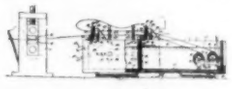
1,714,729. May 28, 1929. **Metal.** Frederick J. Read, San Francisco, Calif., assignor, by direct and mesne assignments, of one-half to Calaveras Iron and Steel Company, a Corporation of Nevada, and one-half to Sydney H. Demarest, San Francisco, Calif.

A metal comprising an alloy including from one-tenth of one per cent to ten per cent cerium, from five to ten per cent aluminum, and substantially all of the remainder copper.

1,714,667. May 28, 1929. **Treatment of Solutions Containing Tin and Arsenic for Precipitation of Tin.** Henry Harris, London, England.

Method of preferential recovery of tin from a solution containing tin and arsenic, which consists in adding calcareous matter as the precipitating agent for the tin, to such a solution already containing a suitable CO_2 compound to prevent the simultaneous precipitation of arsenic.

1,714,668. May 28, 1929. **Apparatus for Cleaning Metal** Clifford B. Higgins, Harry A. Higgins, and John Tyler, Detroit, Mich.



An apparatus of the type described, comprising a tank having a cleaning solution therein in which active and inactive rolls of sheet material are maintained, with said rolls adapted to be successively unwound, a washer associated with said tank, scraping devices at each end of said washer, with one of said devices adapted to remove the cleaning solution from the strip of material and the other scraping device to remove the liquid from the strip of material, and a roll holder in said tank for supporting rolls of sheet material therein to be attacked by the cleaning solution, with one of said rolls supported in a reserve position to assume an active position when an active roll is empty.

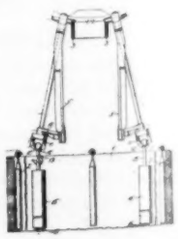
1,714,679. May 28, 1929. **Alloy.** D. C. Lee, Spokane, Wash.

An anti-friction metal comprising an alloy of approximately 80% brass and 20% Babbitt metal.

1,714,767. May 28, 1929. **Process for the Reduction of Metallic Oxides.** Arthur Jules Francois Joseph Cousin, Jemeppe sur Meuse, Belgium, assignor to The Société Anonyme John Cockerill, Seraing, Belgium.

The process for the reduction of metallic oxides of relatively heavy non-volatile metals comprising finely comminuting the metallic oxide, separately finely comminuting a reducing agent, thoroughly mixing such comminuted materials together to obtain a substantially uniform mixture thereof, introducing into said mixture a sufficient quantity of water to fill the interstices between the particles thereof for thereby displacing the air therefrom substantially completely and replacing it with water, then compressing the substantially airless saturated mixture to expel any remnants of residual air and to bring the particles of the metallic oxide and of the reducing agent into intimate contact, and thereafter subjecting the said compressed water-containing mixture to the action of a neutral flame at a temperature sufficient to produce a reducing reaction but below that of fusion of the metal in a neutral atmosphere having no oxidizing effect on the solid metal at the temperature of treatment.

1,715,357. June 4, 1929. **Electroplating Machine.** Wesley F. Hall, Matawan, N. J., assignor, by mesne assignments, to Hanson-Van Winkle-Munning Company, Matawan, N. J.



In an electroplating machine, a cathode carrier having rotatable shafts journaled thereon on substantially vertical axes, wheels on said shaft adapted to ride on rails, and a flange on the upper side of said wheels to catch oil drip from the journals.

Equipment

New and Useful Devices, Machinery and Supplies of Interest

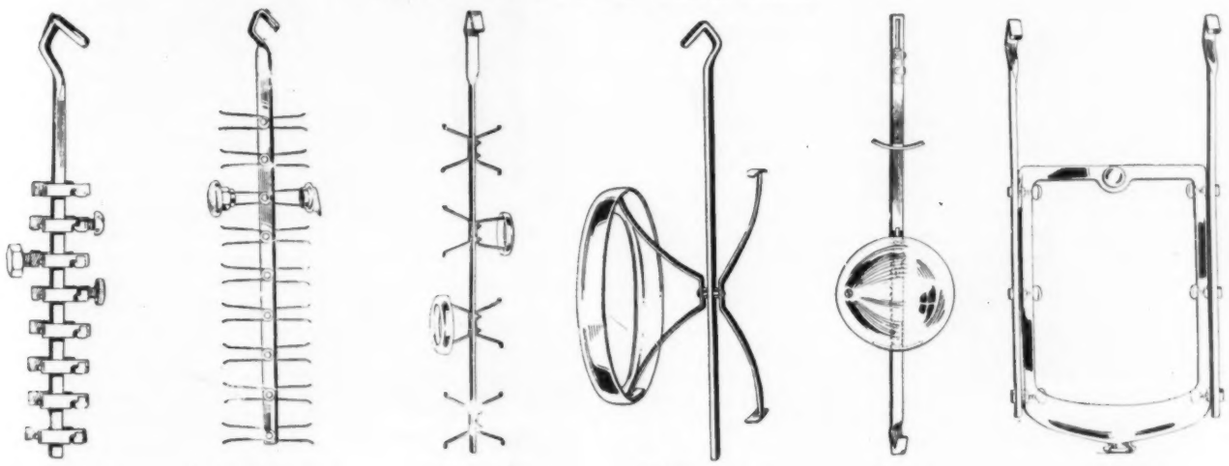
New Chromium Racks

A new type of chromium rack, said to have extremely practical features, has been developed by the Belke Manufacturing Company, 2863 Van Buren Street, Chicago.

This firm has decided, from close contact with the development of this method, that most of the success of chromium plating racks are claimed to have several other advantageous features. For conditions where a rack of special design is needed to meet the particular requirements of the work, this firm is equipped to design such racks to order.

The standard Belke chromium racks are supplied without covering. To meet the demand for racks with the spine insulated this firm has developed a special compound which withstands

Racks for Chromium Plating Various Articles



Bolts, Nuts, etc. Small Parts Hub Caps Rims, etc. Lamps Radiators

depends on the racks that are used. To meet these important and exacting conditions a line of special racks for this work have been developed.

The great bulk of chromium plating needs, it is claimed by this company, can be met in a satisfactory way with a small assortment of racks, and the Belke engineers have designed a series of six standard racks to meet the needs of the common chromium plating needs.

These racks are built on spines of heavy composition capable of withstanding exceptionally long life. The tips are replaceable and adjustable so as to handle articles of various sizes, and the chromic acid. The spines can be supplied, covered with this compound which, it is claimed, should provide insulation for six months to a year. A lacquer can also be supplied for painting the racks in the shop, and this, it is claimed, gives protection for limited time use.

These Belke chromium racks are claimed to fit the needs of every shop, large or small, equally well, and have adjustments so that any sized article can be plated. The Belke Company is issuing special literature covering chromium plating and the application of these racks, and it is understood that this data will be sent to any plating shop on request.

New Bronzing Lacquer

The Roxalin Flexible Lacquer Company, Inc., announces the development of a new bronzing lacquer which, it is claimed, will not jell or discolor within 36 hours when mixed with bronze powder. This eliminates the waste caused by jellying and discoloration when a batch of bronze lacquer is not completely used up in one day, and forms a stiff jelly overnight because of the interaction of the bronze powder with the lacquer. It also makes it unnecessary for the operator to stop from time to time in his spraying, to mix small fresh batches of bronze powders in the bronzing lacquer.

In tests made by the Roxalin Flexible Lacquer Company, Inc., the new bronzing lacquer was mixed one pound of bronze powder to one gallon of bronzing lacquer, and a second mixture was prepared containing two pounds of bronze powder to one gallon of bronzing lacquer. These mixtures were allowed to stand for 96 hours.

At the end of 36 hours, mixture No. 1 showed no jelly formation and no discoloration. Mixture No. 2 showed no jelly formation and slight discoloration. At the end of 96 hours mixture No. 1 showed no jelly formation and a slight discoloration. Mixture No. 2 showed both jelly formation and discoloration.

At the recent Exposition of Chemical Industries in New York,

Columbium

the first metallic columbium made in the United States was exhibited by Dr. C. W. Balke, Chemical Director of Fansteel Products Company, North Chicago, Illinois.

Columbium, it will be remembered, is a rare metal similar in many ways to tantalum, which also was first produced in America by Dr. Balke. Columbium was noted as an element in 1801 by Hatchett, who gave the metal its name because the mineral in which he found it came from America. Columbium's atomic weight is 93.5, its specific gravity 8.3, and its melting point about 1950 degrees Centigrade. The metal is silvery in appearance, and may be coated with iridescent colored oxides by electrolysis.

Like tantalum, columbium is inert to practically all chemical action, and is soluble only in a mixture of nitric and hydrofluoric acids. In electrolytes the metal is uni-directional. It readily absorbs gases by occlusion, and has been patented as a "getter" in vacuum tubes. Columbium is very ductile and is easily worked cold. It may be rolled, drawn, hammered, formed or cut with ordinary metal working tools. It welds readily to itself and other metals by the spot welding process. However, the metal must not be subjected to any great amount of heat in atmosphere, or it will become brittle.

Except for about a half-ounce made by Siemens in 1906, the

Fansteel exhibit represents all the metallic columbium in the world. The exhibit consisted of several pounds of the metal in sheets, bars, rods and wire. This represents the first, and perhaps the only occasion when so great a percentage of the world's supply of an elementary metal has been exhibited at one place in the United States.

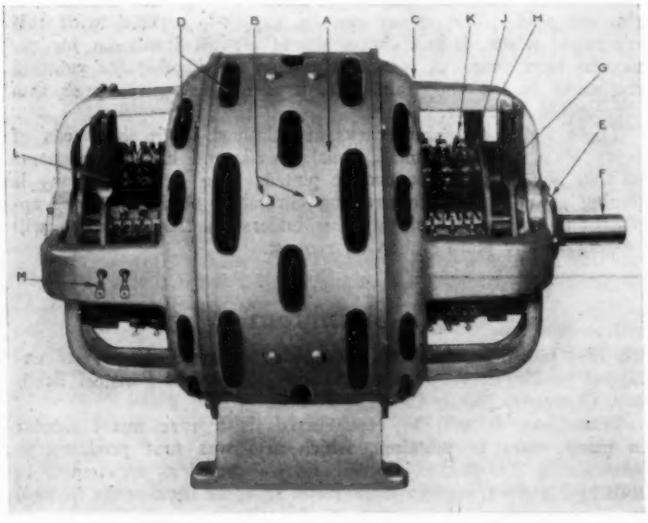
In value, the metal is about one-seventh the price of platinum, and about half the price of gold. When the comparative lightness in weight is considered, the difference in cost is even more marked. With this advantage, columbium should find uses where a noble metal, untouched by corrosives, is needed, or a metal of beauty.

New Low Voltage Generators

The Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio, has developed and placed on the market a new line of low voltage generators for use in electroplating plants. A typical example of these generators is the 6 volt, 6,000 ampere size, double commutator type, weighing 2,275 pounds and measuring 33 inches in height. The following electrical specifications are given by the manufacturer:

Welded steel frames with more than twice the magnetic permeability of cast iron, designed on uniform electrical and mechanical lines. Laminated poles made of high grade sheet steel held to frame by two bolts which prevent turning or loosening. Channel shaped end bracket arm cross section to maintain rigidity and reduce weight. Ventilated end bracket ring fitting into machined recess in field frame. Forced ventilation and cooling through openings in frame and end brackets. Timken double row roller bearings. Alemite lubrication. Extra large diameter shafts of fibrous core chrome-manganese steel. Integral cast copper collector ring and terminal with sufficient cross section and width to carry over twice the rated amperage.

Fibre rocker arm separating collector rings to prevent short circuiting of positive and negative terminals. Slots in rocker arm to permit adjustment for commutator wear. Integral cast brush holders, fully machined and centered, permitting use of at least 90 per cent brush length. Brushes of metallic graphite composition, designed to eliminate friction and sparking at light loads and



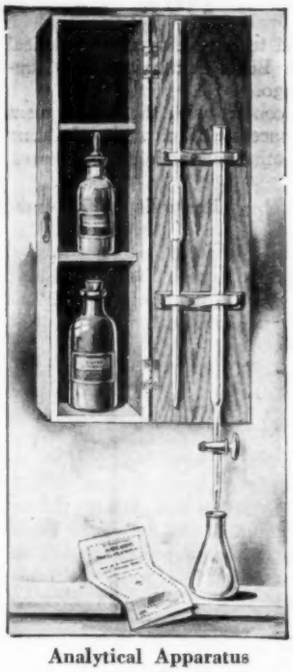
Low Voltage Generator

heavy overloads. Brush shunts of ample carrying capacity. Brush holder spring permitting simple adjustment in brush tension. Easy inspection or replacement of brushes by means of thumb screws without necessity of dismantling.

Separate excitation as positive prevention of reversal of polarity, with terminals brought through end bracket. Cross connected commutators assembled from pure high grade copper and insulated with pure amber mica. Armatures of larger units built on spider, for ventilation, with laminations made of high grade electrical sheets, individually insulated to reduce eddy currents and hysteresis losses. Windings perfectly insulated and held in place tightly in armature slots. Coils consisting of a number of small conductors of rectangular cross section and wound on armature to eliminate crosses between two halves of winding.

The company states that the line includes a range of sizes for various uses. Complete information is available upon request to the makers.

Solution Analysis Outfit



Analytical Apparatus

A set of aparatus for use in determining the sulphate content of chromium electroplating solutions has been developed and placed on the market by the State Manufacturing Company, 4722 South Turner Avenue, Chicago, Ill.

This outfit, according to the makers, provides a rapid and accurate means of making the test. It is stated that the results can be read directly and that only seven minutes' time is necessary for obtaining a determination.

The company has also developed apparatus for testing nickel plating solutions for chloride content. This is said also to be a direct reading method, showing the content in ounces per gallon.

The makers state that these methods are in direct line with the modern trend in electroplating as they provide rapid and accurate scientific control of solutions.

Special Thermometers

A. E. Moeller Company, Brooklyn, N. Y., is placing on the market mercury filled thermometers with a red reading column. This effect is obtained by means of their invention which is called Moeller Glass.

In reading these thermometers, it is necessary only to note the bottom of the red glass column which naturally is the top of the mercury column and the correct temperature.

It is stated that Moeller Glass is made in such a way that the mercury and the red glass column stand out clearly and distinctly, eliminating usual light reflections in mercury filled tubes.

Cutting Down or Glazing Compound

A material was developed over five years ago by Harrison and Company, Haverhill, Mass., which it is claimed, cuts fast and at the same time polishes. This No. 4 AAAA Black Regular material is used successfully on Monel metal and other exceedingly hard metals. The usual lathe or buff with a speed of 2800-3000 R. P. M. will give the desired results.

Special machinery is used for the manufacture of this compound, said to be far superior to hand operation as the blending is perfect at all times. The makers will be pleased to forward free samples for test purposes.

New Aluminum Melting Process

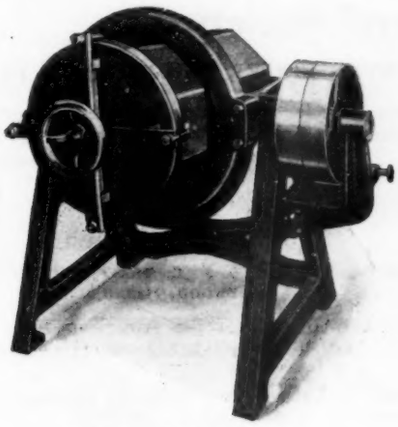
It is reported by the National Bronze and Aluminum Foundry Company, Cleveland, Ohio, that they have perfected a process for refining aluminum, thus making the metal uniform in composition.

They have developed a furnace in which raw material is melted and the necessary alloys added, at the same time eliminating oxides and other impurities in one operation. The resulting metal has been given the trade name Tenual.

The company reports operations at the rate of 6,000,000 pounds yearly.

New Ball Burnishers

A new ball burnishing barrel is being manufactured by Lasalco, Inc., St. Louis, Mo. This barrel is supported near the center on a heavy roller bearing, consisting of 24 rollers, properly spaced by two container rings. These revolve between the accurately machined inner surface of the supporting ring and machined race way on the barrel. This bearing carries practically the



Ball Burnishing Barrel

entire load of the barrel and its contents when in operating position. It is said to require only a fraction of the power necessary for the overhang type of barrel.

The drive mechanism is simple, strong and positive, consisting of a short shaft carrying the tight and loose pulleys and a beveled pinion on the inside end which meshes with the large ring gear. This gear is bolted to the roller bearing base on the barrel and can easily be removed and replaced.

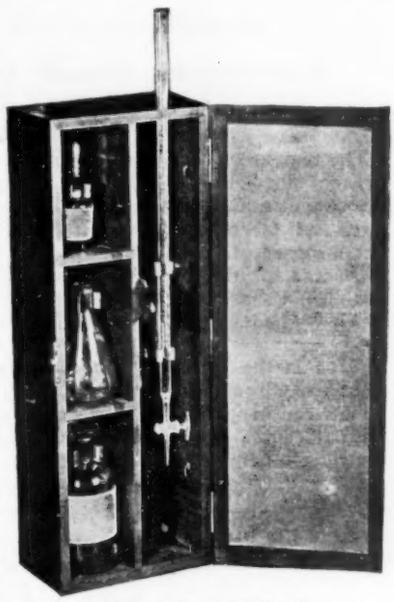
Bulletin No. 9 published by Lasalco gives full information on the methods of operation of this barrel details of construction and considerable data on barrel burnishing in general.

Electroplating Control Apparatus

Walter S. Wood Company of Boston introduces itself as a manufacturer of electroplating control apparatus with the presentation of the C.I.C. Titration Set. This instrument is designed to measure chloride ion concentration in nickel solutions, reading directly in ounces per gallon without the necessity of any calculations.

Substantial construction is used in all details to insure safe portability and freedom from mechanical difficulty in operation. All parts of the unit are securely fastened, by means of spring clips, in a substantial, dustproof box which in itself serves as the support necessary for the apparatus when in use.

Great care is evident in the preparation of the instruction sheet which, it is claimed, makes chemical knowledge unnecessary either in making a determination of chlorides or in the adjustment of the solution based on that measurement.



Solution Control Outfit

Equipment and Supply Catalogs

Materials Are Important. Page Steel and Wire Company, Bridgeport, Conn. Welding wire leaflet.

The Chips Tell a Story. E. F. Houghton and Company, Philadelphia, Pa. Leaflet on cutting oils.

High Speed Snagging. Norton Company, Worcester, Mass. Bulletins covering 16 inch and 24 inch swing frame machines.

What It Takes to Make Laclede-Christy Fire Brick. Laclede-Christy, 1711 Ambassador Building, St. Louis, Mo. Illustrated leaflet.

Better Pickling Results. The Weaver Brothers Company, Adrian, Mich. Circular on temperature controls, pickling materials and pickle testing pills.

C-E Water Level Indicator. Combustion Engineering Corporation, 200 Madison Avenue, New York City. Illustrated folder on a new product of this company.

Welded Chain. American Chain Company, Bridgeport, Conn. Leaflet on use and abuse of this type of chain; also contains tables on safe working loads, etc.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., publications: Type NAB Nofuz Panelboards; Power at the Touch of a Button (line-starters).

Suggestions from McPhilben Studios. McPhilben Studios, 153 Jamaica Avenue, Jamaica, N. Y. Illustrated catalog of colonial, early American and English design fixtures.

Standard Arch Industrial and Boiler Furnace Construction. Standard Arch Company, Frostburg, Maryland. Booklet on a new construction method. The company is affiliated with the Big Savage Fire Brick Company.

Rolled Zinc. The New Jersey Zinc Company, 160 Front Street, New York City. Complete technical and descriptive data on all rolled forms of this metal, in illustrated booklet punched to fit standard size notebooks.

Duriron Centrifugal Pumps. The Duriron Company, Inc., Dayton, Ohio. Bulletins 151 and 152, covering pumps No. 102 and 403, respectively. Leaflets giving full engineering and descriptive data. These pumps are for acid handling, etc.

A Study of Dirt. Cowles Detergent Company, Cleveland, Ohio. Contained in Cowles Comments, company publication, this series of three articles comprises a discussion of the scientific side of metal cleaning. Free on request to the company.

General Electric Company, Schenectady, N. Y., publications: Buda Gas-Engine-Driven Arc Welder; Fan-Cooled, Squirrel-Cage, Totally-Enclosed Motors; Automatic Starting Compensators; Arc Welding Accessories; Direct-Current Motors Type BD; Arc Welder, Type WD-400A.

Metal Finishing Information. The Egyptian Lacquer Manufacturing Company, New York City. Four new cards for inclusion with the binder issued by this company some time ago. The new cards give the following finishes: Jet Black Electro Deposit; Brown on Copper; Imitation Fire Gilt Finish; English Bronze. The cards are available gratis upon request to the company at 90 West Street, New York City, or its various branches.

Plating, Polishing and Finishing Materials and Equipment. Lasalco, Inc., 2822-38 Lasalle Street, St. Louis, Mo. A complete, illustrated catalog of all supplies and equipment for electroplating, polishing, finishing, etc., of metals, issued in looseleaf binder. It contains 18 separate bulletins making 180 pages, including tables of technical data on equipment, with good illustrations showing the many devices offered. There is also a portion devoted to plating information, formulae, electrical data and other valuable material.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Los Angeles Branch (Temporary)

HEADQUARTERS, CARE OF M. D. RYNKOFS, 1354 WEST 25TH STREET, LOS ANGELES, CALIFORNIA

The regular monthly meeting of the temporary Los Angeles Branch was held July 10, 1929, at the Central Y. M. C. A., Los Angeles, Cal., Clarence E. Thornton presiding. Twenty-seven sat down to dinner, after which the regular meeting was disposed of.

Officers for the fiscal year were nominated. The meeting was then turned over to Charles Russill, Librarian, for educational discussion. The question box contained the following.

What is the best thing to counteract too much sulphuric acid in a chromium solution?

How can copper bus bar be drilled easily?

What causes copper and brass to turn milky if left in the electric cleaner without current?

These questions were discussed and answered by those present.

The Los Angeles Branch meets every second Wednesday of each month at 6:30 P. M. at the Central Y. M. C. A.

—M. D. RYNKOFS, Temporary Secretary.

Chicago Branch

HEADQUARTERS, CARE OF S. J C. TRAPP, 1127 NORTH 7th STREET, MAYWOOD, ILLINOIS

The Chicago Branch of the American Electroplaters' Society has installed the following officers for the 1929-1930 year:

President, S. J. C. Trapp, formerly secretary-treasurer.
Vice-president, J. J. Witte.
Secretary-treasurer, J. C. Kretschmer.
Librarian, O. E. Servis.
Board of Managers: R. J. Hagucha, chairman; G. Jelineck, R. Kelly.
Sergeant-at-arms, David Greenblatt.

—J. C. KRETSCHMER, Secretary.

National Metal Congress

HEADQUARTERS, 7016 EUCLID AVENUE, CLEVELAND, OHIO

Institute of Metals Program

The Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers has announced a program of papers to be presented during its annual fall meeting, to be held at Cleveland during the week of September 9, 1929, simultaneously and in co-ordination with the National Metal Congress and the National Metal Exposition, which was announced in these columns last month. The papers to be presented include:

Metallography of Commercial Thorium, by E. S. Davenport, Westinghouse Lamp Works, Bloomfield, N. J.

The System Cadmium-Mercury, by Robert F. Mehl and Charles S. Barrett, Naval Research Laboratory, Anacostia, D. C.

Crystal Structure of the Alpha Copper-Tin Alloys, by Robert F. Mehl and Charles S. Barrett.

Cold Working of Metals, by R. L. Templin. Aluminum Company of America, New Kensington, Pa.

Eutectic Composition of Copper and Tin, by G. O. Hiers and G. P. deForest, National Lead Co., Research Laboratory, Brooklyn, N. Y.

Effect of Alloying on the Permissible Fiber Stress in Corrugated Zinc Roofing, by E. A. Anderson, New Jersey Zinc Company, Palmerton, Pa.

Determining the Orientation of the Crystal in Rolled Metal from X-Ray Patterns Taken by the Monochromatic Pinhole Method, by Wheeler P. Davey, C. C. Nitchie and M. L. Fuller, New Jersey Zinc Company, Palmerton, Pa.

Metal Recoveries in Secondary Aluminum Practice, by Dr. R. J. Anderson, Fairmont Manufacturing Company, Fairmont, W. Va.

Reclaiming Non-Ferrous Scrap Metals at Metal Manufacturing Industries, by Francis N. Flynn, Milwaukee.

Manufacture of Wire Bars from Secondary Copper, by W. A. Scheuch and J. Walter Scott, Western Electric Company, Hawthorne Station, Chicago.

Secondary Bronze, by H. M. St. John, Detroit Lubricator Company, Detroit.

Battery Lead, by F. F. Colcord, U. S. S. Lead Refinery, New York.

Reclaiming White Metal Waste, by Mr. Potter, Federal Mogul Corporation.

Cuppy Wire, by Mr. Remmers, Western Electric Company, Hawthorne Station, Chicago.

At the National Metal Exposition, over 275 manufacturers, it is announced, will exhibit the latest equipment, supplies and the newest processes and methods that have to do with the making, working, treating, welding and use of every kind and form of metal. These exhibits, many of which will be in operation, will cover over 80,000 square feet of floor space.

American Electrochemical Society

HEADQUARTERS, CARE OF COLIN G. FINK, COLUMBIA UNIVERSITY, NEW YORK CITY

Fall Convention at Pittsburgh

The Fall Convention of the American Electrochemical Society will be held at Pittsburgh, Pa., September 19th, 20th and 21st, 1929, with headquarters at the new William Penn Hotel.

The general program will include visits to a number of industrial plants in the Pittsburgh district, and scientific and technical sessions, at which papers on various electrochemical subjects will be presented by prominent scientists and engineers. A symposium on "Contributions of Electrochemistry to Aeronautics," which is attracting world-wide attention, will emphasize the lightweight Aluminum and Magnesium alloys used in aeroplane and airship construction. Dr. J. D. Edwards of the Aluminum Company of America will preside at this symposium, and noteworthy among those who will also take active part are: Edward P. Warner, Editor of "Aviation"; Dr. George W. Lewis, Director of Aeronautical Research, National Advisory Committee for Aeronautics, and Mr. Starr Truscott, Assistant to Dr. Lewis.

There will also be sessions on organic electrochemistry and on the electroplating and refining of various metals, including chromium. An unusually attractive open discussion has been arranged for by the officers of the Electrothermic Division. A number of electric furnace experts will participate.

Full pre-convention details will be contained in our September issue.

American Society for Testing Materials

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

New Officers and Directors

The following new officers and directors were elected at the thirty-second annual meeting of the American Society for Testing Materials, held June 24-28, 1929, at Atlantic City, N. J.:

President—T. D. Lynch, consulting metallurgical engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Vice-President—F. O. Clements, technical director, Research Laboratories, General Motors Corporation, Detroit, Mich.

Executive Committee—G. B. Haven, professor of machine design, textile laboratory, Massachusetts Institute of Technology, Cambridge, Mass.; C. R. Hook, vice-president and general manager, American Rolling Mills Company, Middletown, Ohio; H. E. Smith, engineer of materials, New York Central Lines, New York City; G. E. Warren, assistant general manager, Portland Cement Association, Chicago, Ill.

British Institute of Metals

HEADQUARTERS, 36 VICTORIA STREET, LONDON, S. W. 1, ENGLAND

Meeting in Germany

In accordance with previous announcements the Autumn Meeting of the Institute will be held in Düsseldorf, Germany, from September 9 to 12, 1929, by kind invitation of the Verein Deutscher Ingenieure and the Deutsche Gesellschaft für Metallkunde.

Following the meeting in Düsseldorf, a visit will be paid to Berlin; alternatively a trip in Holland will be arranged.

The following papers are expected to be presented during the technical sessions:

BANNISTER, C. O. "Studies on the Crystallization of Gold from the Liquid State."

BLAZEY, C. "Idiomorphic Crystals of Cuprous Oxide in Copper."

BUDGEN, N. F. "Pinholes in Aluminium Alloy Castings."

CHEVENARD, P., PORTEVIN, A. M., and WACHÉ, X. F. "A Dilatometric Study of Some Univariant Two-Phase Reactions."

FRIEND, J. NEWTON. "The Relative Corrodibilities of Ferrous and Non-Ferrous Metals and Alloys. Part II.—The Results of Seven Years' Exposure to Air at Birmingham."

HAAS, M., and UNO, D. "An Improved Differential Dilatometer."

HUDSON, O. F., HERBERT, T. M., BALL, F. E., and BUCKNALL, E. H. "Properties of Locomotive Firebox Stays and Plates."

LOBLEY, A. GLYNNE. "The Creep of 80:20 Nickel-Chromium Alloy at High Temperatures."

MASING, G. "Methods of Research in Metallography."

ROHN, W. J. P. "Reduction of Shrinkage Cavities and Vacuum Melting."

ROSENHAIN, W. "Some Methods of Research in Physical Metallurgy."

TAMA, M. "New Methods for Melting Non-Ferrous Metals in the Electric Furnace."

VERNON, W. H. J., and WHITBY, L. "The Open Air Corrosion and Surface Patina of Copper."

ZEERLEDER, A. von, and BOURGEOIS, P. "Effect of Temperature Attained in Overhead Electric Transmission Cables."

Persons who desire to participate in the Congress should write for particulars without delay to the Secretary of the Institute of Metals, G. Shaw Scott, M.Sc., 36 Victoria Street, London, S. W. 1, England.

Lighting Equipment Association

HEADQUARTERS, 711 GRAYBAR BUILDING, LEXINGTON AVENUE, NEW YORK CITY

New Managing Director

Charles L. Benjamin was appointed managing director of the Artistic Lighting Fixture Association at the midsummer convention held at Atlantic City, June 5 to 8, 1929. He succeeds Granville P. Rogers. Mr. Benjamin is an advertising man. He started his career in New York with the George P. Rowell advertising agency and was the first editor of "Printers' Ink," an advertising magazine which was founded by the Rowell concern. Later, he spent five years with the Century Company, New York, publishers. In 1898 he enlisted for service in the Spanish-American War and after that he aided in establishing American business methods in Cuba. After some years of special advertising work, he became advertising manager for the Cutler-Hammer Company, Milwaukee, Wis., where he remained for seven years. He then established an advertising business in Chicago. Upon the entry of the United States into the World War he became manager of the education section of the Chicago Ordnance Department. After the war he returned to the advertising field, handling the accounts of many concerns in the chandelier and other manufacturing lines.

Personals

L. W. Spring

L. W. Spring, with J. J. Kanter, was awarded the Charles B. Dudley medal for 1929 by the American Society for Testing Materials (for details, see THE METAL INDUSTRY for July, 1929, page 322).

L. W. Spring

Mr. Spring was born at Coldwater, Mich., September 22nd, 1876. He graduated from Coldwater High School in 1894 and from the University of Michigan in 1901, as a B.A. in chemistry. He was chemist for the Illinois Steel Company, South Chicago, Ill., in 1899-1900; chemist of the Wolverine Portland Cement Company, Coldwater, Mich., in 1901; foreman of the Plate Mill, Illinois Steel Company, 1901-1904. From 1904 to 1906 Mr. Spring was a chemist for the Crane Company of Chicago. From 1906 to 1914 he was in charge of their laboratories, and since 1914 he has been their chief chemist and metallurgist. He has had wide experience in non-ferrous metallurgy and is known for his work in this field.

Mr. Spring is the author of a number of articles on chemicals and physical testing and engineering in the technical press and before technical societies. He is a member of the following organizations: American Chemical Society, American Institute of Mining and Metallurgical Engineers, American Society for Steel Treating, American Society for Testing Materials, Institute of Metals of Great Britain, American Association for the Advancement of Science, Chicago Chemists Club, City Club of Chicago, and Masonic Orders, etc.

F. C. Frary, director of research for the Aluminum Company of America, Pittsburgh, Pa., has been elected president of the American Electrochemical Society for the year 1929-30. Dr. Frary has been with the Aluminum Company in his present capacity since 1919, when he left the Chemical Warfare Service of the United States Army. He has distinguished himself by the invention with Dr. S. Temple of "Frary" metal and by his development with Major D. J. Demorest of the largest phosgene plant in the world. Dr. Frary graduated from the University of Minnesota in 1905 and was a member of that school's faculty for the following ten years.

William W. Sieg, 303 West Linden Street, Rome, N. Y., for the past four years assistant metallurgist for the Rome Brass and Copper Company, has resigned in order to accept the position of metallurgist for the Titan Metal Manufactur-

ing Company, Bellefonte, Pa., manufacturers of brass and bronze rods, shapes, automatic screw machine products and hot pressed forgings. Mr. Sieg is now located at 27 East Curtin Street, Bellefonte.

George E. Irvin, foreman plater, Penn Hardware Company, Reading, Pa., and Mrs. Irvin have returned from a four-month vacation during which they traveled in California, Colorado, Arizona and Utah. As they were returning, they stopped over at Detroit, Mich., for the convention of the American Electroplaters Society. Mr. Irvin has resumed his duties with the Penn Hardware Company.

Thomas Evans, vice-president of the Merchant and Evans Company, Philadelphia, Pa.; **Charles R. Hook,** vice-president of the American Rolling Mill Company, Middletown, Ohio; and **Charles Piez,** chairman of the Link-Belt Company, Chicago, Ill., have been chosen as a committee to study immigration questions for the Chamber of Commerce of the United States.

L. H. Beyer has been appointed sales director of the Durbar bearing bronze division of the Buffalo Bronze Die Cast Corporation, Buffalo, N. Y. Mr. Beyer was for many years connected with the American Radiator Company in Buffalo and New York City, first as manufacturing executive and later as director of purchases.

Edmund R. Thews, president of Thews-Harbison-Thews, Inc., Philadelphia, Pa., consulting chemists and metallurgists, has accepted a position as teacher at a "Politechnicum" (technical school) at Halle, Germany.

Hedley Richards of Lasalco, Inc., St. Louis, Mo., and Mrs. Richards, have returned from a two months' stay in England.

Obituaries

George H. Braman

The death on June 1, 1929, of George H. Braman, production superintendent of the American Brass Company, Waterbury, Conn., was briefly mentioned as the June issue went to press.

George H. Braman, who died at the age of 59 after a long period of ill-health, was one of the general officers of the American Brass Company and had for years been active in this company's progress in the Naugatuck Valley. Born in Easthampton, Mass., May 12, 1870, the descendant of Daniel Braman, soldier in the American Revolution, and the son of Henry Braham, Civil War veteran, he was brought to Torrington, Conn., in 1871 by his father, who secured a position in the Coe brass works there. His father remained with that firm for fully a third of a century, retiring from active business only a few years ago.

George H. Braman

George H. Braman attended the schools at Torrington first and then went to the Hudson River Institute, Claversack, N. Y. At sixteen he worked, during school vacations, at the Coe plant. In April, 1888, he took a permanent position with the company, filling various minor jobs until he was promoted in 1903 to superintendent of the Coe branch. In 1914 he was again promoted, becoming general superintendent of production, with offices at Waterbury. In this position he supervised all the activities of the company's plants. He reorganized the Wallace factory at Ansonia, Conn., which was merged with the Coe firm, his wide experience enabling him to place that plant on a productive par with the other Coe works. When the company became a part of the American Brass Company, he continued as one of the chief operating officials.

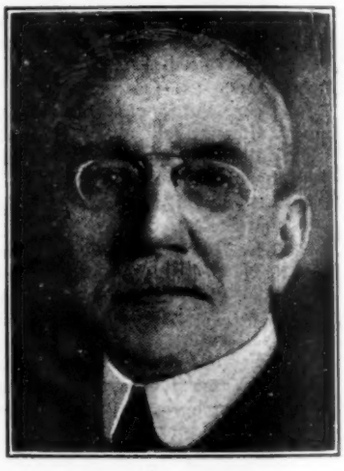
Besides his connection with the American Brass Company, Mr. Braman was also a director of the Torrington Manufacturing Company, the Dayton Manufacturing Company and the Torrington Ice Company.

Mr. Braman was married in 1893 and is survived by his widow, a son, two daughters, his father and grandchildren.

Edward L. Frisbie

Edward Laurens Frisbie, executive vice-president of the American Brass Company, died at his home in Waterbury, Conn., July 3, 1929. He was in his 75th year, having been born November 22, 1854. His death occurred on the return from a short pleasure trip with his family.

Mr. Frisbie was educated in the Waterbury schools and at Williston Seminary, Connecticut. He entered the employ of Brown and Brothers in 1872; his father, Edward L. Frisbie, Sr., was financially interested in the firm and later also became interested in the Benedict and Burnham Manufacturing Company. Edward L. Frisbie, Jr., followed him, going to Benedict and Burnham in 1884. He become secretary, treasurer and finally president of this company. He was also president of the Waterbury Watch Company from 1891 to 1892, and for a time was president of the American Metal Hose Company. When the Benedict and Burnham Company became part of the American Brass Company, he became one of its vice-presidents, and after the absorption of the American Brass Company by the Anaconda Copper Mining Company, he became the former's executive vice-president.



Edward L. Frisbie

He was a director of the Colonial Trust Company and vice-president of the Dime Saving Bank. He served on the Waterbury Board of Finance from 1914 to 1918. He was a member of St. John's Episcopal Church, the Waterbury Club, the Waterbury Country Club, the Sons of the American Revolution, and the Union League Club of New York.

He was married on December 5, 1878 to Nellie Lynde Dickinson, who survives him with one daughter, Miss Helen Frisbie. The funeral was held July 5.

"He was one of the finest citizens Waterbury ever had," said President John A. Coe of the American Brass Company, speaking of Mr. Frisbie. "In addition to being a successful business man, he was a good friend and citizen, being of a quiet, modest, retiring disposition, of poise and good judgment. He made a distinct contribution to Waterbury's civic and industrial life and his passing is a real loss to the community. He stood for the best, the highest type of citizenship. Having a natural analytical mind, he was very thorough and painstaking. Although sober-minded and conservative, he was also forward looking and progressive. Men like him are all too rare.' W. R. B.

James Purdie

James Purdie, founder of the old Graebert and Purdie Company, Detroit, Mich., brass finishers, now known as the Graebert and Son Company, died recently at the home of a nephew in Cleveland, Ohio. Mr. Purdie was 74 years of age and had been apparently enjoying good health when he left Detroit a few days before his death. He retired from active business many years ago. —F. J. H.

News of the Industry

Industrial and Financial Events

American Brass Buys Randolph-Clowes

After many months of negotiation, the American Brass Company, Waterbury, Conn., has acquired the business, machinery, inventory, good will and all assets except the land and buildings of the Randolph-Clowes Company of the same city. It will operate the latter concern until about October 1 and then, it is understood, it will move all the machinery and other equipment to some of its own factories. The land and factories of Randolph-Clowes will then be sold separately. As the American Brass Company did not buy the land and buildings, it is believed that its principal object was to acquire the trade of the other company and also its valuable patent and trade rights, particularly in the boilers and large-sized tubes in which it specialized. It owned patents on certain boilers and had an almost exclusive trade in large-sized brass and copper tubes, of which it made the largest in the world.

The company has outstanding 5,000 shares of $100 par value each, which would give it a capitalization of $500,000, but its true worth is considered more than twice that amount. Its land and buildings are valued at $350,000. Of the 5,000 shares, 4,700 belong to the estate of the late Charles Miller.

For various reasons the purchased company, one of the older brass concerns of Waterbury, did not expand as rapidly as did the others there. It always contented itself with a certain specialized trade in which it had almost a monopoly instead of reaching for new lines. Its plant was originally the Brown and Elton Company, the "Elton" being John Elton, grandfather of John P. Elton, former vice-president of the American Brass Company. Its rolling mill was the first to be operated entirely by steam power instead of water power. It was reorganized in 1851, becoming Brown and Brothers. Mr. Elton dropped out and Philo, William, James and Augustus Brown took over the company. They did a prosperous business until 1880, when financial difficulties were encountered and internal dissension brought about the retirement of all the Browns except Philo, who, however, soon died and was succeeded by his son, William H. Brown.

The firm was liquidated in 1886 and the new firm of Randolph-Clowes formed. George H. Clowes, who had been bookkeeper for the former firm, took over active management, and Edward F. Randolph, a retired New York manufacturer, furnished most of the capital. At the end of three years the business had grown to $600,000 annually. The death of Mr. Randolph in 1898 was followed by litigation which ended in the defeat of Mr. Clowes. Charles Miller of Waterbury, by court decree obtained the controlling interest in the concern. He was chosen president, his son-in-law, Frank Taylor, vice-president and secretary, and Charles Hall treasurer. Mr. Miller died in 1917.

Edward L. Frisbie, Sr., former president of the Benedict and Burnham Company, now part of the American Brass Company, entered the employ of the old Brown & Elton firm in 1849 and was with it and its successors for 30 years. His son, Edward L. Frisbie, Jr., whose death last month is reported in this issue, entered the firm's employ in 1872 and was with it until 1884 when he went with Benedict and Burnham, later becoming that firm's president and finally vice-president of the American Brass Company.

The Randolph-Clowes plant has 20 buildings and a railroad track frontage of 700 feet. It has a casting shop, rolling, rod, tube and wire mills, and manufactures sheet brass, copper and German silver, brass, copper and German silver wire and tubing, brass kettles, rivets and burrs and operates a small re-manufacturing department where ferrules, thimbles, burners and other small articles are made. It has a special line of seamless brass and copper tubes of large diameters (up to 32 inches) and specializes in seamless hot water tanks and boilers, still sold under the name of "Brown and Brothers." Its present officers are: president, Ralph H. Smith; treasurer, Wilbur P. Bryan; secretary, H. I. Farnum.

W. R. B.

Brass Ingot Orders and Deliveries

The unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., as of July 1st amounted to 12,809 tons.

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute as of July 1st amounted to a total of 7,625 net tons.

Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending July 19th. As there are, as yet, no generally accepted specifications for ingot brass, it must be understood that each item listed below is a compilation representing numerous sales of metal known to the trade by the designation shown, but each item, in reality, including many variations in formulas. Until the program of standardizing the principal specifications, now progressing in co-operation with the American Society for Testing Materials, is completed, the following specifications will be understood to refer to "commercial grades."

Grade	Cents
Commercial 80-10-10 (1% impurities)	17.326
Commercial 78% metal	15.358
Commercial 81% metal	15.984
Commercial 83% metal	16.034
Commercial 85-5-5-5	16.279
Commercial No. 1 yellow Brass ingot	13.055

Non-Ferrous Metals Consumption

The American Bureau of Metals Statistics, New York City, reports the use of various non-ferrous metals in the manufacture of electric refrigerators in 1928, with comparative figures for 1926 and 1927, as follows, in tons of 2,000 pounds:

	1926	1927	1928
Copper	15,093	15,751	13,791
Zinc	1,650	644	1,913
Tin	331	325	279
Lead	318	520	328
Aluminum	163	191	405

The figures are for basic metals used in such parts as tubes, sheets, bronze, solder, etc., except the metals used in the motors, which are figured elsewhere. Similar figures for metals consumption in washing machines, exclusive of metals in motors, are estimated as follows:

	1926	1927	1928
Sheet copper	3,800	2,800	3,200
Sheet brass	800	400	500
Sheet zinc	1,100	600	700
Brass fittings	750	500	600
Bronze fittings	300	350	350
Aluminum	10,200	8,800	9,200

Republic Brass Corporation Income

The report of Republic Brass Corporation, New York City, for the six months ended June 30, 1929, shows a net operating profit after depreciation of $3,789,562 and net income, after deducting miscellaneous charges, interest on funded debt and provision for Federal income taxes, of $2,957,617. This compares with $1,849,461 earned by the same properties on the same basis during the first half of 1928, prior to the consolidation into Republic Brass Corporation.

Dallas Brass and Copper Company Expands

Contracts for three new building units to cost approximately $500,000 have been awarded by the Dallas Brass and Copper Company, Chicago, Ill., according to a recent announcement by C. D. Dallas, president. These additions will be made to the present rolling mills located on a 25-acre plot at 66th Street and Grand Avenue, Chicago. A substantial addition to the brass mill and two new buildings will be erected for the carpenter shop and to house the engineering department and machine shop. These buildings will conform in design to the present plant.

Chicago's growing demand for brass and copper is well reflected in the growth of the Dallas Brass and Copper Company which operates the only rolling mills within the city limits. Founded in 1907, this company erected a three-story plant at 820 Orleans Street in 1920. In 1925 a holding of twelve acres was purchased at Grand Avenue and the first units of the present extensive rolling mills were erected. Later additional acreage was bought on which a modern casting shop and complete brass and copper mills are now located. The Orleans plant is now largely devoted to general offices and departments which fabricate brass and copper products and lockseam tubing. Comprehensive plans are now being made for the erection of additional units which eventually will occupy the entire 25 acres at Grand Avenue.

Would Remove Aluminum Deoxidizer Duty

The American Iron and Steel Institute, through Thomas J. Dougherty, its tariff representative, is seeking to eliminate or modify the duty of five cents per pound on silicon aluminum, aluminum silicon, ferrosilicon aluminum and ferroaluminum silicon, which are used as deoxidizers in steel manufacture. The contention of the Institute is that these compounds are made directly from bauxite (aluminum ore) in the electric furnace and never reach the stage of real metals, suitable for manufacturing purposes, which are dutiable as aluminum alloys, etc. It was recommended that these deoxidizers be classed with alloys used for manufacture of steel and be made dutiable at 25% ad valorem. Five cents per pound is 82½% ad valorem, it was pointed out, and exists in the present tariff schedules due to a Treasury decision.

General Cable Corporation Income

The General Cable Corporation, New York City, reports a net profit of $1,275,251 for the June quarter after charges and Federal taxes. That compares with net of $821,207 for the June quarter of last year. The net for the June quarter was equal to $1.27 a share on 477,460 shares of common stock after preferred dividends, against 76 cents a share earned in the preceding quarter and 36 cents a share earned on 440,000 common shares in the June quarter of 1928. The net profit for six months ended June 30 was $2,300,222, which was equal to $2.03 a share earned on 477,460 shares of common stock. That compared with $1,192,052, or $1.66 a share, earned on 400,614 shares the first half of last year.

Bohn Aluminum and Brass Corporation

The Bohn Aluminum and Brass Corporation, Detroit, Mich., reports for six months to June 30 net income of $1,781,579 after all charges and taxes, equal to $5.08 a share on 350,831 capital shares outstanding, against $1,644,089, or $4.70, on 350,000 shares in the 1928 period. June quarter profit was $761,826, equal to $2.17 a share, on 350,831 shares, against $1,019,753, or $2.91, on 350,489 shares in the preceding quarter, and $825,998, or $2.36 a share, on 350,000 shares in the second quarter of 1928.

International Silver Company Income

The International Silver Company, Meriden, Conn., and subsidiaries report for the three months ended June 30, 1929, net income of $383,622, after depreciation, interest and Federal taxes, equivalent, after 7 per cent dividend requirements, to $3.05 a share on the 91,200 shares of outstanding common stock. This compares with net income of $268,819, equivalent to $1.79 a share on the outstanding common stock in the preceding quarter, and with $240,118, equivalent to $1.47 a share on the outstanding common stock in the second quarter of 1928.

Additions for Two Aluminum Plants

The Aluminum Company of America, Pittsburgh, Pa., is proceeding to erect a 130 by 482 foot machine shop at its New Kensington, Pa., plant, and a large tube mill addition at its plant in Arnold, Pa.

The new machine shop supersedes the present smaller shop and will provide modern facilities for repairing equipment such as rolling mills, shears and automatic machinery. The shop is to have a large open working floor serviced by fifty-ton cranes, and a mezzanine floor to accommodate light tool equipment. The 153 by 425 foot addition to the company's present tube mill at Arnold, Pa., will house heat-treating equipment as well as tube-drawing benches and the usual accessory facilities.

Work has been started on the new buildings which will be of brick and steel construction; they are being designed and built by the company's own organization. The company states that all new equipment for the new units has been selected and purchased.

The purchase by the Aluminum Company of America of the Modern Foundry and Pattern Works of Oakland, California, is understood to be a forerunner of the acquisition of several others in kindred lines on the Pacific Coast.

The Modern Foundry and Pattern Works was established in 1925 and has a capitalization of 24,000 common shares of $100 par. J. H. Russell, president and Peter Caird, vice president, will continue in present capacities. The company manufactures all forms of aluminum castings and distributes in 11 western states.

Metals Freight Rate Investigation

The Interstate Commerce Commission, Washington, D. C., has issued a notice in which it lists a number of additional nonferrous metals on which the freight rates are to be examined as a part of the Commission's rate structure investigation No. 17,000, Part 12. The list includes a number of raw copper, brass and bronze commodities, scrap of these metals, various lead drosses, ashes, skims, alloys, etc., certain forms of zinc and its derivatives, and certain forms of antimony and tin. The proceeding outlined in the notice will take place October 7, 1929, at 10 a. m. standard time, at the Hotel Sherman, Chicago, Ill., Examiners Mullen and Carney taking charge. Complete information can be obtained from the offices of the Commission, Washington, D. C.

Chase Brass Buys Minneapolis Firm

The Chase Companies, Inc., Waterbury, Conn., have acquired the Irvine Brass and Copper Company of Minneapolis. As this is a warehouse and distributing company, it will provide another outlet for the distribution of the Chase concern's goods in the Middle West. The president of the Irvine company, C. C. Irvine, will stay with it as manager. The Irvine company will hereafter be known as the Twin City branch of the Chase Brass and Copper Company. It will handle Chase products such as "Alpha" brass plumbing pipe, "Chase" copper water tubing, bronze and copper screen cloth, "Chamet" bronze welding rods, copper leaders and gutters, copper nails, tacks, etc. W. R. B.

Fairmont Manufacturing Company

The Fairmont Manufacturing Company, Fairmont, West Va., producer of aluminum sheet and castings, is installing a large electric heat-treating furnace. The equipment will be used chiefly in heat-treating aluminum-alloy sheet. Dr. Robert J. Anderson, vice-president of the company, states that the new furnace will be in operation by about September 1.

Yale and Towne in Merger

Yale and Towne Manufacturing Company, Stamford, Conn., has merged with the Stuebing-Cowan Company, Cincinnati, Ohio, manufacturer of hand lift trucks, skid platforms, etc., making what is believed to be the largest company in the world manufacturing electrical and hand lift trucks and allied products.

Aluminum Plant Explosion Kills Eight

Eight men were killed and a number of others severely injured on the night of July 18, when an explosion wrecked a part of the Logans Ferry aluminum powdering plant of the Aluminum Company of America, Pittsburgh, Pa. The plant manufactures aluminum powder used as a base for paint and ink, and the blast was caused by firing of the powder, which is extremely volatile. The cause of the fire was unknown at last report, but officials of the company, Pittsburgh city officers and experts of the United States Bureau of Mines were seeking the cause. Company officials stated that many precautions are taken to prevent danger, but the powder can be fired by any spark. It was their belief that the fire originated in a mixing machine.

Metals from Secondary Sources

The value of certain nonferrous metals recovered from secondary sources in 1928 is reported to the United States Bureau of Mines, Washington, D. C., as $277,623,500, which is $21,271,500 more than in 1927. This increase in total value, according to J. P. Dunlop, who compiled the figures, was due mainly to larger recoveries of copper, brass, lead, and nickel, and to the higher average price of copper in 1928, for the average prices of lead, zinc, and tin were considerably less in 1928 than in 1927. There were large gains in the quantity of secondary copper, lead, and nickel in 1928, and small increases in the quantity of secondary zinc and aluminum, and small decreases in the quantity of tin and antimony. The quantity of copper, including that in brass, increased more than 46,000 tons.

Federated Metals Corporation Income

The Federated Metals Corporation, New York City, reports for the six months ended May 31 a net income of $714,181 after interest and depreciation, equivalent, after allowing for Federal taxes, to $2.54 a share on 245,843 shares of capital stock. This compares with $288,653 in the corresponding period of 1928, and earnings of $3.30 a share in the entire twelve months of 1928. Current net assets as of May 31 amounted to $10,770,393, including cash of $1,304,390, compared with current liabilities of $1,581,294.

Thomas Buchanan Company Liquidating

Stockholders of the Thomas Buchanan Company, Cincinnati, Ohio, plating, polishing, grinding, lacquering and enameling equipment and supplies, have voted to dissolve the company and the board of directors, composed of William, Thomas and M. M. Buchanan, has been appointed liquidating agent.

The company has advised all creditors to present claims. A certificate of dissolution has been filed.

Aluminum Company Power Project

Aluminum Company of America, Pittsburgh, Pa., owner of power rights on the Little Tennessee River and its tributaries, in the Nanthalie section of North Carolina, will soon begin work on a $15,000,000 power development announced two years ago.

Plant to Make Aluminum Chairs

Contract has been awarded by the General Fireproofing Company, Youngstown, Ohio, for the construction of a new building which will be used for manufacturing aluminum office chairs. It will contain 90,000 square feet of manufacturing and shipping space and will be ready by the middle of October. The addition will provide employment for 300 men.

Sidney Brass Works Buys Wapak

The Sidney Brass Works Company, of Sidney, Ohio, makers of brass, bronze and aluminum castings, has acquired the Wapak Holloware Company, of Wapakeneta, Ohio, makers of cooking utensils. George Trautman is president of the ownership company.

Antimony Consumption

American industries consume each year nearly half of the world's production of antimony, according to a study of the marketing of that metal made by J. W. Furness, Chief of the United States Commerce Department's mineral division, the results of which have just been published. Production of this metal in the United States is negligible, practically all of American requirements being obtained from foreign sources. However, the report shows, this situation need cause little concern to American manufacturers as antimony is a metal which can easily be replaced by substitutes, if the need arises.

Consumption of virgin antimony in normal times is greatly influenced by the reclaimed metal. In times of war consumption is markedly increased, the world consumption being 78,000 tons. During the past five years the annual consumption has varied between 18,000 and 29,000 tons.

Electric Heat Slogan

The slogan "Investigate Electric Heat" won the first prize of $250 in the recent industrial electric heat contest conducted by the joint committee on Electric Furnace Development of the National Electrical Manufacturers Association and the National Electric Light Association. It was submitted by W. H. Steinhauer of the Engineering Department of the Toledo Edison Company, Toledo, O. Second prize of $100 was awarded to C. H. Pfingsthorn, 106 West Lincoln Avenue, Mt. Vernon, N. Y. whose slogan was "Switch to Perfection With Electric Heat." "Electric Heat is Cheaper Than Rejects" won the third prize of $50 and was submitted by E. A. Heath, 211 East First Street, Fond Du Lac, Wisconsin.

Aluminum Wire Supplanting Copper Abroad

The extensive use of aluminum wire for overland telegraph and telephone lines is reported from Germany and other continental countries, as well as Great Britain, where there has been a tendency to supplant copper wire with aluminum for power transmission as well as for message conveyance lines. In Germany, the copper manufacturers are said to be claiming that the past year has seen more of their customers changing over to the use of aluminum wire than ever before, resulting in the placing of much smaller orders for copper by fabricators.

Anaconda Buys Marion Wire Company

The Anaconda Wire and Cable Company, subsidiary of the Anaconda Copper Mining Company, New York, has purchased the Marion Insulated Wire and Rubber Company, Marion Ind., for $425,000 cash and 7,445 shares of stock.

Houdaille-Hershey Corporation

The Houdaille-Hershey Corporation has purchased 4,750 shares of common stock of the Skinner Company, Ltd., Gananoque, Ontario, Canada, manufacturer of brass and aluminum castings.

Atlas Plating Works Expands Plant

The Atlas Plating Works, Cleveland, Ohio, is adding 21,000 square feet of factory space to its plant at 277 East 156th Street. Additional machinery for chromium, tin and lead plating in addition to nickel, copper and brass plating is being installed. The force of workers will also be increased.

Platinum and Allied Metals in 1928

The platinum refiners of the United States in 1928 purchased 365 ounces of crude placer platinum of domestic origin and 57,962 ounces of foreign crude platinum, according to the United States Bureau of Mines, Washington, D. C. In 1927 the refiners purchased 236 ounces of domestic crude platinum and 48,907

ounces of foreign crude platinum. Domestic material purchased in 1928 included 299 ounces from California and 66 ounces from Oregon. Purchases of foreign crude platinum in 1928 were: Australia 1,086 ounces, Canada 14 ounces, Colombia 53,744 ounces, and from countries not specified 3,118 ounces.

New Companies

Production Foundry Company, 2700 Magnolia Street, Oakland, Cal., has been established for the manufacture of aluminum castings. Company has purchased property comprising 14,500 square feet, the foundry occupying 4,730 square feet of this. Approximate value of buildings and equipment is $17,000. **Leon Cameto** is owner and general manager.

The Greenite Company, Inc., 1 to 15 Newfield Street, Buffalo, N. Y., has been organized by **William Weiner** and associates, to manufacture foundry supplies, including the "Greenite" and "Dryite" brands of fireclay, firebrick, cereal binders and core oils. Production will be started shortly, it is planned. **Harold J. Tillou,** 21 Charham Drive, Buffalo, is also interested in the company.

White Brothers Smelting Corporation, Inc., Philadelphia, Pa. (See Business Items—Verified).

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

AUGUST 1, 1929.

The Scovill Manufacturing Company will start at once the construction of an addition to its East plant. The estimate given of the cost is $75,000.

The Lux Clock Company is planning an addition to its plant. The details of the plan have not been completed so it is not known what form it will take or what the cost will be.

E. W. Goss and **E. H. Davis,** representing the **Scovill Manufacturing Company,** appeared before the sub-committees of the Senate finance committee at tariff hearings in Washington, D. C., the latter part of June, urging higher rates on buttons and other metal articles. **Charles C. Shee** of this city, representing a number of pin manufacturers, urged higher rates on common and safety pins.

Among patents granted the past month, is one on a paper holder to **Charles Beardsley,** president of the **Beardsley and Wolcott Manufacturing Company. Alva T. Smith,** assignor to the same company, received patents on electric range fixtures. —W. R. B.

Bridgeport, Conn.

AUGUST 1, 1929.

The Bridgeport Brass Company is preparing plans for an extensive addition. This will be the second to be erected within a year.

The Stanley Works is making extensive changes in the former **American Tube and Stamping Company** plant and modernizing the equipment. Two old hot mills are being replaced with a new modern mill, and a new office building is planned.

Business of the **American Chain Company** has been so much better during the first half of the year than in the same period last year that there is no comparison, according to **Wilmot Wheeler,** its treasurer.

The Bridgeport Hardware Manufacturing Company is showing a very good increase for the first half of the year as compared with the same period last year. **Treasurer Harry B. Curtis** states. Increasingly, however, the margin of profit is becoming slighter and the competition keener, he says. Orders received are also on hand-to-mouth basis rather than the big stock orders formerly received. —W. R. B.

Connecticut Notes

AUGUST 1, 1929.

NEW BRITAIN—Business of the **American Hardware Corporation** for the first six months of 1929 is approximately the same in volume as for the same period last year. **George T. Kimball,** president, of the company, states. The number of employees shows an increase of two per cent. The business of two of the divisions depends upon the construction industry which has fallen off slightly, but this is offset by the good effect of conditions in the automobile industry to which the other two divisions cater.

C. F. Bennett, president of the **Stanley Works,** states that business has been good the past six months, showing no striking variation from the preceding period. Employment figures have varied scarcely at all during the year.

Business of **North and Judd Manufacturing** Company shows a healthy gain over the previous six months, President **F. M. Holmes** states. New designs in buckles and fasteners are being put out. The acquisition of the **Traut** and **Hine** plant has increased the manufacturing facilities. An extra dividend of 25 cents a share and the regular dividend of 50 cents was paid on the North and Judd stock on July 1.

An extra dividend of 25 cents a share was paid on the stock of **Landers, Frary and Clark** on July 1, in addition to the regular dividend of 75 cents.

BRISTOL.—Alexander Harper, president of the Bristol **Brass Corporation,** states the company's business for the past six months has been considerably in excess of that for the same period last year. There was a slight slowing down in June but it is considered only seasonable. Until the price of copper is more firmly established, he said, there will be reluctance on the part of its customers to purchase beyond their immediate requirements. The demand for raw material is expected to increase in the fall. Mr. Harper also states, as president of the **American Silver Company,** that its business is ahead of that for the same period in 1928. The working force is greater than a year ago and some departments are obliged to work over time frequently.

W. K. Sessions, president of the **Sessions Clock** Company, says business is such that the usual summer vacation period has been considerably shortened in anticipation of an unusually heavy demand in the fall. All departments are on schedule.

The new six-story addition at the **E. Ingraham** Company plant is now being occupied and will be in operation next month. A second addition of two stories for lacquering departments will be completed next month. Increases in the employment force will be made gradually.

Both the **New Departure Company** and the **Wallace** Barnes concern have completed and occupied large additions this year and are starting others.

HARTFORD—Colt's Fire Arms has received a large contract from **Pinaud,** manufacturer of toilet articles, for face powder containers. Tests are being made at the government proving grounds of the new Colt semi-automatic shoulder rifle. Its new anti-aircraft gun is now undergoing some changes and orders for it are expected as soon as the changes are completed.

Directors of the **Royal Typewriter Company** have increased the annual dividend from $2 to $2.50 a share, the new dividend to be paid July 10.

Business of the **Standard Screw Company** for the first half of the present year was far ahead of that for the same period last year, according to **President Philip B. Gale.** Production

ran about 20 per cent ahead of that period, which was the best half of the best year in the company's history. The company paid an extra dividend of one per cent in addition to the regular of two per cent on July 15.

NEW HAVEN—**The Acme Wire Company** reports almost double the business during the first six months of the year as compared to the same period last year, according to **Edgar** Hartpence, vice-president and general manager. It is working at more than capacity, with much overtime work.

Richard **Whitehead,** president of the **New Haven Clock** Company reports about the same business during the first six months of the year as in the same period last year; an increase is expected for as soon as the new tariff goes into effect, foreign competition having cut down the company's sales to quite an extent.

The **Winchester Repeating Arms Company** of Delaware has taken over the assets and business of the **Winchester** Company and the **Winchester Repeating Arms Company** of this state. By this change all their products are placed on the open market through regular jobbing channels instead of being sold through selected exclusive agency hardware stores.

MERIDEN—Business of the **International Silver Company** for the first half of the year shows an increase over that for the same 1928 period, C. R. Gardinor, president, reports. Unfilled orders are much heavier than a year ago. All plants are operating at capacity.

The International Silver Company of this city and **R. Wallace and Sons** of Wallingford are included in the list of members of the **Silversmith's Guild of America,** which has given exclusive contracts to the **Commercial Credits Companies** to finance sales of sterling and plate silver on a deferred payment plan.

WINSTED—Walter Davey, general manager of **Strand and Sweet,** enameled wire manufacturers, reports business for the first half of the present year greatly in excess for the same period last year.

The Gilbert Clock Company, according to **Norman Thompson,** president, has had satisfactory business this year, with a slight gain over 1928 in spite of the competition of foreign clock makers. The industry as a whole, he says, has not participated in the prosperity of the past few years because of loopholes in the tariff which the new tariff is expected to close.

SOUTHINGTON—The Walker Stewart Foundry Corporation is to resume operations. It filed a petition in bankruptcy some months ago but has now reorganized with a capital of $50,000. **Victor Walker,** former president, is one of the incorporators of the new company.

TERRYVILLE—Business at the **Eagle Lock Company** is so good that instead of the usual annual shut down of two weeks at the fourth, the plant closed for only four days.

—W. R. B.

Middle Atlantic States

Newark, N. J.

AUGUST 1, 1929.

The **Sonatron Tube Company,** 57 State Street, Newark, has let a contract for a six-story reinforced concrete factory at 78-82 Eighth Avenue, to cost $175,000. The concern will manufacture radio tubes.

The **Emark Battery Corporation,** West Orange, N. J., has been incorporated with $1,000,000 capital to manufacture storage batteries. Eugene C. Reed, West Orange; Joseph F. McCoy, Rahway; and William A. Hardy, Summit, are the incorporators.

A verdict of **$50,000 obtained by the Canister Company,** of Phillipsburg, N. J., in Federal Court against the Congress Cigar Company has been affirmed by the United States Circuit Court in Philadelphia. The action resulted from a contract between both parties in which the cigar company was to take a consignment of containers. The case was heard by Judge Runyon.

The **Marino Auto Radiator and Metal Works, Inc.,** 412 West Second Street, Plainfield, N. J., has purchased another plant at Waynewood Park and will increase its production. The company has been operating twenty-four hours a day for some time in its electro-plating plant. The concern plates 400 pairs of lamp brackets daily for Ford cars. The work is done for the **Aluminum Die Casting Company,** of Garwood, which is expected to increase its production to 1,000 pairs of brackets daily for the **Ford Motor Company.** The concern also plates a carload of tinplate a month for a New Brunswick company.

The following Newark concerns have been incorporated: **Trutone Manufacturing Company;** $125,000; manufacture radio supplies. **Andrew A. Taylor Company, Inc.;** 1,000 shares common; manufacture gold and silver wares. **Goerdes Metal Goods, Inc.;** $50,000 preferred and 500 shares common; manufacture metal novelties. **National Ring Company;** $100,000; manufacture jewelry. **Centralized Radio Corporation;** $100,000 preferred and 1,000 shares common; radio equipment. **Lincoln Watch Case Company, Inc.;** 5,000 shares no par; manufacture watch cases. **Newark Galvanizing Company;** 5,000 shares no par; galvanizing.

—C. A. L.

Trenton, N. J.

AUGUST 1, 1929.

The **John A. Roebling's Sons Company** is again expanding its huge plant here by the erection of a large factory addition on South Broad Street. The plant will be in two units and will cost $118,000. The contract has been let to John W. Ferguson and Company, of Paterson.

The New Jersey Zinc Company is cooperating with other large manufacturing concerns in protesting to Governor Larson about the discontinuance of lighterage at the Port of New York. The concerns say the discontinuance of lighterage means increased cost of freight.

T. Arthur Karno, of Trenton, has been appointed receiver for **Wiring Devices, Inc.,** of Trenton, by Vice-Chancellor Buchanan. The concern was incorporated for the purpose of manufacturing wiring devices.

The eastern plant of **Alunite Products, Inc.,** will locate at Glassboro, N. J. The company will have a capacity of fifteen tons of chemical products daily from its first unit. The company will operate under a contract with the **Florence Mining and Milling Company,** which has mines in southerr Utah.

The Victor Metal Aircraft Company, recently formed, announces that it will locate its factory on the Ellis farm, near Mount Holly, N. J. The company will start with 100 employes and will make a plane of all metal. A flying field and accommodation for visiting flyers will be laid out. The company was formed by business men of Mount Holly. **H. P. Wanner** will head the staff of aeronautical engineers. He is former vice-president and general manager of the **Knoll Aircraft Corporation,** Wichita, Kan., **Quick Air Motors,** of the same place, and **American Eagle Aircraft Corporation,** Kansas City.

Following new concerns have been incorporated here. **Boonton Research Corporation,** Boonton, N. J., 2,500 shares common; electrical and insulated goods. **Bergen Metal Products, Inc.,** Hackensack; 500 shares common and $50,000 preferred; metal products. **Universal Electric Lamp Company,** Irvington; 500 shares no par; electrical appliances. **The Pyrotec,** Union City, $100,000; manufacture radio tubes. **Protective Devices Company,** Camden; $50,000 preferred and $50,000 common, manufacture metal devices.

James Young and Sons, of Paterson, N. J., has been chartered with $50,000 capital to manufacture brass goods. The officers of the company are James Young, James A. Young and Ronald R. Young, all of Paterson.

New Loan Company, of Newark, was chartered with $300,000 preferred and 5,000 shares common, to manufacture jewelry.

—C. A. L.

Middle Western States

Detroit, Mich.

AUGUST 1, 1929.

The regular mid-summer quiet has settled over general manufacturing in this area, and the non-ferrous metal plants are sharing in this. Not much in the way of improvement is expected for the next few weeks. This condition is nothing out of the ordinary for this season of the year. Production has decreased decidedly and there is a considerable amount of unemployment.

While most of the plants are running full time, the employees are scheduled to work only three or four days a week. In this way the organizations are kept intact and every one earns sufficient to help him over the quiet period.

Some of the accessory plants, however, still are operating on their regular schedules, but most of them are on curtailed production. The motor plants and the body manufacturers are operating on a more or less curtailed basis. Most of these are engaged on the new models which go on the market shortly. Almost immediately after these begin to appear the motor plants start to show activity. This is expected to manifest itself this year in even greater proportion than a year ago. The outlook for the industry is considerably more favorable this year than every before. Many have extensive orders booked ahead, but for the new fall models.

The airplane industry is beginning to operate in increased volume. The Detroit plants have experienced no decline during the summer and most of them are well supplied with orders. This industry, an extensive consumer of non-ferrous metals, is growing larger every month.

The Campbell, Wyant and Cannon Foundry Company's stockholders recently approved the acquisition of the **National Motor Castings Company** through the issuance of 33,000 shares of Campbell stock. Approximately 75 per cent of the outstanding stock was represented in person or by proxy. This is one of the largest jobbing foundries in the world. Production records were shattered during the first six months of 1929, after the company completed an expansion program involving an expenditure of more than $800,000 in buildings and equipment. The plant, with floor space in excess of 400,000 square feet, is now taxed to capacity by increased requirements of customers.

A new organization known as the **Sky Specialties Corporation** has recently come into existence at Detroit. It is headed by **Charles B. Bohn,** president of the Bohn Aluminum and Brass Corporation, who, with his associates, recently purchased the Heywood Starter Company, also of Detroit. It is planned to expand the new corporation to include the manufacture of other airplane necessities, it is stated. **Arthur L. Cash,** formerly president and manager of **Northway Motors,** is president of the Sky organization. Directors are **Charles B. Bohn; S. D. Den Uyl,** the latter being secretary of the **Bohn Aluminum and Brass Corporation; Fred L. Riggin,** secretary of the **Mueller Brass Works; William B. Stout, Stanley E. Knauss, Edward F. Robberts, John Cowan, Jr.;** and **S. L. McKay.**

Sales of the **Bohn Aluminum and Brass Corporation** in the first half of the current year totaled upwards of $18,000,000. It also is announced that all of Bohn's automotive customers have been retained for the last half of the year.

E. S. Evans, president of the recently formed **Detroit Aircraft Corporation,** has been elected a director and president of the **Ryan Aircraft Corporation,** which was acquired by the Detroit concern through an exchange of stock a few weeks ago. Harold Emmons, chairman of the board of Detroit Aircraft, also has been made a director of Ryan. The former St. Louis directors have been reelected and in addition **John C. Mulsen,** formerly general manager of Ryan, has been elected vice-president and general manager of the organization.

The General Plating Company, 1343 Sherman Street, Detroit, is a new Michigan corporation. Its capital stock is $15,000. It is engaged in a general plating, polishing and buffing business. The owners are **William A. Nadvornik, Jacob Miller** and **Harry L. White.**

The Great Lakes Aircraft Corporation has been awarded a contract for a fleet of 18 three-purpose battle planes by the **United States Navy,** according to **B. F. Castle,** president. The order aggregates $700,000.

S. G. Butler, former assistant personnel manager of the **Buick Motor Company,** at Flint, has been named personnel director of the **Campbell, Wyant and Cannon Foundry,** Muskegon, Mich., succeeding **David J. Grant,** resigned. Mr. Grant will become Industrial Commissioner at Monroe, Mich.

Announcement is made that the **Pyle Pattern and Manufacturing Company,** Muskegon, Mich., is prepairing for a substantial increase in production. It recently completed a two-story brick addition and also has installed new equipment, all of which will add 50 per cent to the capacity of the plant. This company manufactures metal patterns for automobile, truck and tractor castings.

Plant additions have been completed at the **Maring Wire Plant,** Muskegon, Mich., to provide for an increase of 500 per cent in fine wire capacity. Two buildings have been erected and drawing, enameling and insulating equipment installed at a cost approximating $150,000. This concern manufactures enameled and magnet wire for use in automobile ignition units, radio sets, generators, motors and other electrical apparatus. The plant now produces 15,000,000 pounds of magnet wire a year. The company, which also has a plant at Anderson, Ind., was absorbed by the Anaconda organization last May.

The Ford Motor Company, according to announcement, will enlarge its airplane factory at Dearborn, increasing the floor space by 155 per cent to make possible the production of one trimotored, all-metal air transport a day. Throughout the early part of the year the production has been three planes a week, but a short time ago the rate was stepped up to four planes a week. It is stated that all of the present buildings of the Ford aviation division will be retained and additions made so as to permit larger scale, more efficient production and movement of parts towards assembly. All airplane activities will be centered in the plant at Dearborn. Provisions will be made, it is stated, for the production there of parts now being made at the River Rouge plant. Facilities for finishing and trimming of the cabin interiors of the big planes will be so increased that twelve may be handled at the same time.

—F. J. H.

Toledo, Ohio

AUGUST 1, 1929.

Like all other lake cities, particularly those in the motor territory, Toledo, at present, is experiencing a moderately quiet period. This is only seasonal and had been expected. It arrived on schedule time and very likely will disappear on schedule—which is along about August 15 or a little later perhaps. While non-ferrous metal manufacturers are more or less restricted on production, plating plants are fairly holding their own. This is due largely to diversified industries which are not all affected alike.

After a five-hour session in Toledo on July 11, directors of the **Willys-Overland Company** and principals interested in the syndicate purchasing a big block of Willys-Overland stock, **A. B. Quay,** secretary of the company, issued the following: "Late Wednesday, a syndicate including **George M. Jones,** president of the Ohio Savings Bank and Trust Company; **Marshall Field** and **Charles Glore,** of Field, Glore and Company of Chicago; **C. O. Miniger,** president of the **Electric Autolite Company;** and officers of the Willys-Overland Company purchased from **John N. Willys** a very substantial portion of his personal holdings of the Willys-Overland common stock. Mr. Willys, who personally negotiated the deal, said that it does not mean his withdrawal from the company.

—F. J. H.

Cleveland, Ohio

AUGUST 1, 1929.

No particular change has taken place in general industrial conditions here within the last four weeks except that it is

a little more quiet. Most of the manufacturers in non-ferrous metals are going through the usual midsummer quiet period. This is to be expected and is not causing any great concern.

The airplane industry is luring many manufacturing organizations just at this time. This business is holding out great promise. It is a great field for manufacturers of metal parts and is adding quite a number of plants during this dull period.

The **Peerless Motor Car Company**, has elected **J. A. Bohannon** of Indianapolis as president. Formerly he was vice-president of the **Marmon Motor Company**, having been with that organization for a number of years.

With the purchase of the old **Wills Ste. Claire, Inc.**, factories at Marysville, Mich., by the **Allied Motors Industries**, it is announced that production will start as soon as machinery can be moved to Marysville. Equipment will be transferred from the **Great Lakes Aircraft Company's** factory at Cleveland, which is a subsidiary of Allied Motors Industries. The Marysville plant is to be turned over to the production of "Cirrus" Motors and amphibian planes.

—F. J. H.

Wisconsin Notes

AUGUST 1, 1929.

O. H. Theleen, vice-president of the **Frost Company**, Kenosha, Wis., has resigned to accept a position as district manager for the Chicago territory of the **Bohn Aluminum and Brass Corporation** of Detroit, effective August 1. Mr. Theleen has been connected with the Frost Company since its organization, starting as timekeeper and passing through various positions to that of vice-president and general superintendent, which position he occupied for many years.

The Gordon Metals Corporation, has been incorporated in Milwaukee to deal in metal products, etc. Signers of the articles of incorporation are **S. Crolius, E. Crolius and E. Nohl.** Capitalization has been set at 1,000 shares at no par value.

The Metalware Corporation of Manitowoc has taken over two buildings in that city formerly operated by the **Wisconsin Basket Company.** One building will be turned to warehouse purposes while the other will be used as part of the assembling department of the plant. —A. P. N.

Other Countries

Birmingham, England

JULY 19, 1929.

The forthcoming congress of metallurgists to be held on the occasion of the autumn meeting of the **Institute of Metals**, at Dusseldorf, Germany, from September 9 to 12, promises to be extraordinarily interesting. Already nearly 200 persons from all over Europe, and some from America, have indicated their intention to participates in the gathering. The congress will comprise the presentation and discussion of about 15 scientific and practical papers relating to metallurgical work, visits to works in or near Dusseldorf and Berlin, receptions, dances and other social functions. Persons who desire to participate in the congress should write for particulars without delay to the Secretary of the Institute of Metals, **G. Shaw Scott, M. Sc.**, 36 Victoria Street, London, S. W. 1.

The **non-ferrous rolling mills** of Birmingham have started the second half of the year with better prospects New business is not plentiful, but activity is maintained by the greater readiness of consumers to take delivery against contracts. This is particularly the case among brass and copper tube makers, who have been busy on small sizes in the motor trade at home and a certain amount of export business. The store fixture trade has been exceedingly busy for some time, not only in Birmingham but all over the country, and metal tubes of various descriptions have been called for by this industry. Stainless steel is being used in all sorts of new ways hitherto undeveloped and the works producing this metal are among the busiest. Shipbuilders are making heavier demands upon local tube works and brassfounders, although the revival of shipbuilding is not sufficient to warrant a steady flow to all the brassfounders, business being unevenly distributed. A strike in Australia has been holding up the demand for brass work in that country.

Chromium plating has definitely established itself as a popular finish for motor car parts and more and more cars are seen on the roads having the bright shining chromium fittings. The British manufacturers were a long while taking to the new idea but the competition from America hastened its use in England inasmuch as the English car makers were finding themselves left behind. Chromium plating is being used also in home fittings, although not to the same extent as in automobiles, chiefly because the houses now being erected are not of the standard in which expensive fittings are included.

Makers of aluminium hollow-ware are doing a steady business, although they could handle a good deal more. The chief difficulty seems to be the competition between manufacturers at home on the one hand and competition from Continental firms on the other. The cheap German goods make it very difficult to secure orders in the export markets. The Aluminium Hollowware Association for some time has had before it the question of standardization, in the hope of bringing home manufacturers into line upon points now in dispute. The Association, however, has not been able to carry the question very far, owing to the fact that certain important firms have not yet given their support to the proposed scheme.

The wrought enamelled hollow-ware trade is one of the industries which have benefited from the application of the safeguarding duty, and firms in the Black Country have been able to give greater employment since the duty was imposed twelve months ago. Exports are growing and the first half-year's result shows a welcome improvement as compared with last year. Imports are still in excess of exports but these have declined during the last twelve months.

—J. A. H.

Business Items—Verified

Pangborn Corporation, Hagerstown, Md., manufacturer of sand-blast equipment, has plans for a one-story addition, to cost more than $100,000 with machinery.

Wisconsin Metal Products Company, Racine, Wis., plans construction of a one-story addition, 56 by 136 feet, to be used as a tool room. The company manufactures stampings.

Hy. Schiffman Company, Milwaukee, Wis., manufacturers of solder, Babbitt metal and lead products, has removed to its new plant and offices at 678-684 South Pierce Street.

J. J. Seifen Company, Lansing, Mich., manufacturers' agents for polishing and plating equipment and supplies, has opened a warehouse at South Bend, Ind., according to **I. E. Seifen**, an official.

John A. Roebling's Sons Company, Trenton, N. J., manufacturer of wire rope, cables, etc., has awarded general contract for a one-story addition, to cost about $125,000 with equipment.

The Kasle Iron and Metal Company, Toledo, Ohio, has in process of construction a new building to cost about $40,000 with equipment. The company is engaged in scrap iron and metal business.

Jewel Emblem Manufacturing Company, 1500 West Fifty-ninth Street, Chicago, Ill., will erect an addition, 46 x 78 ft. The following departments are operated: tool room, stamping, soldering, plating, polishing, lacquering.

Jacob Pearl, 6970 Jefferson Avenue, West, Detroit, Mich., has changed its name to **Detroit Metal and Sales Company** in order to indicate the nature of the concern more clearly.

The company deals in non-ferrous metals and alloys.

B. Mercil and Sons Plating Company, 1911 Fulton Street, Chicago, Ill., manufacturer of plated metal goods, for a one-story addition, to cost about $45,000 with equipment. This firm operates a plating department; also lacquering.

Wagner Electric Corporation, St. Louis, Mo., manufacturers of motors, transformers, fans and hydraulic four-wheel brakes, has removed its service station and branch sales office at Buffalo, N. Y., to a new building at 1796 Main Street.

Magnetic Manufacturing Company, Milwaukee, Wis., manufacturers of magnetic separators and other equipment, has appointed **Wells Fargo and Company, S.A.,** Mexico City, as exclusive representative for the Republic of Mexico, with **A. J. Hiern** as manager.

C. F. Witters Foundry and Supply Company, 488 Virginia Street, Milwaukee, Wis., are now representing the **E. Reed Burns and Sons, Inc.,** 1811 Carroll Avenue, Chicago, Ill., carrying a stock in Milwaukee of the "Erbco" line of polishing and buffing compositions.

General Brass Company, Detroit, Mich., has taken a Prudential group insurance policy covering the lives of 301 employees, each of whom is insured for an amount ranging from $1,000 to $3,000, according to the rank and position, the workers and company sharing the costs.

Davidson Enamel Products, Inc., of Indiana, owned and controlled by the same group as **Davidson Enamel Products, Inc.,** Lima, Ohio, has completed seven months of operation of its new plant at Connersville, Pa., doing sheet steel work exclusively for stoves, signs, refrigerators, etc.

Eastman Manufacturing Company, Manitowoc, Wis., manufacturers of hose couplings and other metal specialties, has decided to postpone construction of a contemplated addition until the fall or later. Plans have been drawn. The company now has a brass machine shop and tool room.

The Photogenic Machine Company, Youngstown, Ohio, has purchased a new plant at 21 Olive Street, where it will continue to manufacture photograph arc lamps, sunshine lamps, etc. According to **L. S. Kubiac,** general manager, plans for a small foundry addition have been considered but have not yet matured.

Luna Metal Craft Corporation, formerly of West Twenty-first Street, New York City, makers of sheet metal specialties, stampings, etc., has removed to 38-40 Emerson Place, Brooklyn, N. Y. **H. A. Nodler** is president. Besides its tool room, cutting, stamping, spinning and soldering rooms, the company has lacquering and japanning departments.

Wichita Brass and Aluminum Foundry Company, Wichita, Kans., has been absorbed by the Air Industries Foundry Company, Wichita. The brass company has moved from its location at 912 North Washington Street to a new plant at 701-09 East Ninth Street. The following departments are operated: Brass, bronze and aluminum foundry; casting shop.

Century Electric Company, 1806 Pine Street, St. Louis, Mo., has acquired the plant and business of Roth Brothers and Company, 1400 West Adams Street, Chicago, manufacturer of dynamos, power motors and other electrical equipment, and will consolidate. It is proposed to continue the Chicago plant as a branch factory, with transfer of certain products for production at St. Louis.

The Napoleon Stamping Company, Napoleon, Ohio, has been taken over by the Monroe Auto Equipment Company, Monroe, Mich., which is owned by **C. O. Miniger,** president of **Electric Auto-Lite Company,** and **C. S. McIntyre,** president of **Monroe Auto Equipment Company.** For the present, the Napoleon plant will continue to do business at present location. It is intended to expand immediately.

Fusion Welding Corporation, 103rd Street and Torrence Avenue, Chicago, Ill., subsidiary of the **Chicago Steel and Wire Company,** has taken over the sale of all welding rod manufactured by the parent concern, providing one source of supply for both "Weldite" rods and "Fuzon" welding equipment and accessories, previously distributed by both companies. No change in personnel is being made.

Model Brass Foundry, 232 East Decatur Street, Decatur, Ill., is erecting an addition to its plant consisting of an enlargement to furnace room and a new core room. The moving of these two departments from the foundry proper enabled them to secure a fifty percent greater production. The following departments are operated: brass, bronze and aluminum foundry; brass machine shop, grinding room.

Empire Brass Manufacturing Company, London, Ont., Can., has purchased the plumbing supply business of the Canada Metal Company, Toronto, and has taken over the sales staff of that department. The remainder of the business of the **Canada Metal Company** will continue under its old management without change of personnel or policy. The Empire company has branch warehouses in **Toronto,** Winnipeg and Vancouver.

Lionite Abrasives, Ltd., subsidiary of the **General** Abrasive **Company, Inc.,** Niagara Falls, N. Y., is building an abrasive plant at Stamford, Ontario, Canada. Building will be of steel construction, 340 by 65 feet in area and 55 feet high, with auxiliary buildings containing some 5,000 square feet of floor space. The new plant is expected to be in operation by January, 1930, employing 60 men at the start, according to **H. A. Richmond,** treasurer of the General Company.

The Hartford Steel Ball Company, Hartford, Conn., manufacturers of steel balls for bearings, announces the appointment of **Rollin J. Schenk** as district manager of the Chicago office, Room 900, 180 West Washington Street, Chicago, Ill. Mr. Schenk has had years of experience in the ball business, according to **C. H. Abbott,** president of the company, and will be in a position to render service to all customers in his district, including Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri and Wisconsin.

Bacon Felt Company, Winchester, Mass., manufacturers of felting, wool wadding and felt polishing wheels, announces that **Robert Bacon** is no longer associated with the company and that the following are the new officers: **Charles F. Bacon,** president; and his son, **Charles N. Bacon,** vice-president and treasurer. The company was established in 1825 and for five generations has been operated by the Bacons. The new president has been with the company for fifty years and the vice-president for ten years.

The Copperweld Steel Company, Glassport, Pa., announces the establishment of a northeastern district under the management of **George F. Bain.** The northeastern district includes all of the New England States and all of New York State north of Westchester and Rockland Counties. Mr. Bain's headquarters will be at 30 Church Street, New York City. **Paul Van Wagner** is now district manager for Greater New York City and for New Jersey, Pennsylvania and West Virginia, with his offices at 30 Church Street, New York City.

White and Brother, Inc., Philadelphia, Pa., smelters and refiners, has reorganized, taking a Maryland charter under the name of **White Brothers Smelting Corporation,** according to **Clarence B. White,** president of the new company. He states that **Harry A. White,** his brother, has retired from business. The other officers of the reorganized company are **John T. Fegley,** vice-president; **Frank Krug,** secretary; **G. Wilbur Nixon,** treasurer; these have all been in the employ of the company for many years. Aside from these changes, the company will continue to operate as previously, Mr. White states.

M. and M. Development Company is the proposed name of a company which is planned by manufacturers of Monroe, Mich., and Toledo, Ohio. The plan includes the merger of several companies engaged in metal stamping and forging operations and the following are mentioned as interested parties: **C. O. Miniger,** president of the **Toledo Auto-Lite Company** and a director of the **Monroe Auto Equipment Company;** and **President McIntyre** of the Monroe Auto Equipment Company. It is proposed to acquire 1,000 acres of land, now said to be held under option, locate a group of metal working units on industrial sites included in the tract, and to place some of the land on the market as residential sites. Capitalization for the proposed company is $600,000; shares of no par value are to be sold. Officers of the new company would be Mr. Miniger, president, and Mr. McIntyre, vice-president.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

AUGUST 1, 1929.

Domestic consumers have been pursuing a policy of buying from hand to mouth for several months now—since the severe break in the price of copper. Similar tactics have been followed by users of copper purchased from refineries. Europe has been doing about the same thing. Copper producers have curtailed output about 11 per cent, based on world production and the recent statistics while showing a slight increase in the stocks of copper were in my opinion very favorable. The metal that users contracted for during last fall and early spring has now been about all shipped and such purchases as these users are now making is not on contract. I believe that the seasonal lull in buying is about past and that from now on consumers will come into the market. Should foreign buying of copper start in good volume, and there is every reason to believe that it will, it is likely that domestic users will also come into the market to keep their requirements covered. Europe is underbought and if the buying of copper for immediate consumption continues and then the demand for future copper also comes along, together with the demand for copper in this country, let us hope that purchasers will not be unreasonable in their demands. Certain it is that the business of consumers who are large users of copper is not decreasing but on the contrary is on the increase. This state of affairs is expected to continue for some time to come.

Inasmuch as the price of copper has maintained itself at 18 cents during the past several months when demand was at a low ebb, and as business is now beginning to pick up it is hardly to be supposed that metal will be available at a reduced price from now on for several months at least. On the contrary if consumers again come into the market to cover their requirements at the same time and all at once, possibly they may be bidding for the metal before the fall is over. It is believed however that producers will endeavor to supply all needs.

The demand for nickel has reached such proportions that consumers are finding it extremely difficult to obtain early deliveries of their requirements. The expansion in the demand for nickel has been phenomenal and it is confidently believed will continue unabated for many months and even for years. The use of nickel in steel and cast iron is just starting and as such alloys are highly desirable it is only reasonable to assume that their use will become more general.

Deliveries of monel metal are difficult to obtain but if a reasonable time is allowed to obtain one's requirements sufficient sheets, rods, etc., can be obtained. It is suggested that users of monel, and certainly users of nickel in all forms, anticipate their requirements, if possible, and order ahead in reasonable volume.

In my opinion the underlying business situation is absolutely sound and I can see no reason for any drastic curtailment during the next several months. The seasonal slackening has been less than usual and what has occurred has upset the predictions of forecasting services. I believe that the coming months will see extraordinary activity all along the line and that certainly the copper market will feel the effects of the general fall demands of industry.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

AUGUST 1, 1929.

The local market for copper continued steady at 18 cents for domestic delivery and 18.30 cents c.i.f. European ports. Buying activities were not specially aggressive at any time recently. Developments did not lend themselves to vigorous demonstrations. The usual outlets at home and abroad have been taking fair shipments for nearby requirements. The general attitude of consumers, however, reflected conservative interest, but not any marked enthusiasm. There have been no outstanding features to contribute price changes lately and lift the market out of its listless state.

Prospects for heavy consumptive demands are admittedly bright. General conditions favors this expectation. Widespread growth of copper and brass is without parallel. Buying will eventually develop on an enormous scale, and when the pent up demand breaks loose the market will move under the impetus of urgent requirements for the third and fourth quarters of the year. A substantial curtailment of output is also under way. Total production from world reporting sources in June was 174,086 tons against 192,589 tons in May, a reduction of 18,503 tons. A further decrease in output is expected in July and August. This will bring output down from peak figures and keep supplies close to demand. There was active buying for domestic account as this report closes. Market firm, with an upward tendency.

ZINC

Generally the market tone for slab zinc showed some improvement during the last half of July. Prime Western advanced from 6.70 to 6.80 cents East St. Louis after the middle of the month. Producers appeared to rely upon the stiffening of the market to give additional impetus to demand. A fair volume of sales was reported, but the price factor did not prove the stimulating force hoped for. There seems to be less competitive conditions at present, but consuming requirements are not urgent enough to create heavy buying movements at this writing. World output of slab zinc totaled 134.475 short tons in June, against 140,379 tons in May and 128,122 tons in June, 1928. American output in June was 52,953 tons of all grades, being 4,005 tons less than in May. Deliveries, however, fell off and stocks increased 3,106 tons. Stocks in smelters' hands on July 1 amounted to 36,932 tons. Domestic deliveries in June fell off sharply, being 8,641 tons smaller than in May.

TIN

The tin market developed a spirited rise and great activity in July. Conditions were the strongest and most active in several months. Various factors tended to accelerate the advance, chief among them being the agreement by important British producers to stabilize the tin industry on a reasonably renumerative basis. This group is said to control an annual output of about 100,000 tons of tin ore. This item of news had a stimulating effect on values and caused heavy buying both by consumers and speculators. London was the source of much bullish sentiment, and the optimism abroad met with a sympathetic reception here. The bull movement sent prices up from 44.70 cents for spot. Straits tin on July 1 to 47.37½ cents on July 16. Movements in the market were somewhat mixed in the latter half of the month, but consumption is large and trade demand is expected to be maintained at a heavy rate. Obviously the market is under the influence of new developments and these are favorable to strength rather than weakness. American tin deliveries for the first half of the year were 48,090 tons, against 38,460 tons for the first half of 1928, an increase of 9,630 tons. Total visible supply on July 1 amounted to 23,751 tons

as compared with 16,231 tons on July 1, 1928. World visible supply decreased 1,014 tons during June.

LEAD

Recent trend of the market for lead was downward. There were two price declines in the first half of July, and the total recession amounted to a quarter of a cent a pound. The market is now quoted at 6.75 cents New York and 6.55 cents St. Louis, and these figures compare with 7 cents New York and 6.80 cents St. Louis early in July. Various developments were responsible for the lower market. London declines appeared to have their influence on the situation here, and the large increase of 14,414 tons in stocks of refined and antimonial lead in June indicate plainly that surplus supplies of 66,259 tons on July 1st are ample enough to warrant an easy situation. Domestic deliveries during June also fell off 4,218 tons to 57,715 tons, compared with 61,933 tons in May. There was more buying interest displayed recently, and some close observers of developments are looking for more activity in the market in the near future.

ALUMINUM

Large consumption and diversified demand for aluminum have served to maintain the market exceedingly firm. Prices remain unchanged at 24.30 cents for 99 per cent plus and 22.30 cents for 94 per cent plus. Production is maintained on a large scale, but developments in aircraft construction are providing new channels of distribution for aluminum and its alloys. A steadily increasing demand for this metal from the aviation industry is certain. The material is well adapted for office furniture, and the expectation is that this will furnish another important outlet for the product. Bonded stocks of aluminum on June 1 amounted to 8,746,723 pounds, and compared with 4,385,116 pounds on May 1.

ANTIMONY

Conditions in antimony tended to restrict trading much of the time recently. Arrivals of steamer shipments from China were available to buyers at 8¼ cents duty paid, with rumors of a slightly lower figure. These offers had a depressing effect on the market as buyers were not particularly eager to operate. Demand improved in the latter part of the month, and a substantial tonnage was sold for prompt and August delivery at 8½ cents duty paid. Disturbances in China and the possibilities of the situation created a fair amount of buying interest. Demand continued in a moderate way and prices moved up to 8½ to 8⅝ cents for carload lots duty paid. Some improvement in tone of market was evident at end of month, and nearby metal quoted 8⅝ cents. All positions were firmer.

QUICKSILVER

A broader demand and higher prices are reported for quicksilver. Sales have been disclosed at $123.50 which contrasts with $120.50 a short time ago. The European basis is higher than the present quotation here, but some consumers are conservative, being aware of the fact that considerable quantities of the metal are held abroad.

PLATINUM

There are no special features to note in platinum. The movement is on a routine scale, with buyers covering lightly as requirements arise. Refined quotes $63 to $64 per ounce.

SILVER

There was a slight improvement recently in the price of silver. China and India bought moderately on developments in the Manchurian situation. Sellers were more reserved in offering and this lent a better tone to the market. There was some selling by China due to improvement in the Russo-Chinese situation. Silver stocks in Shanghai are still large. A recent decision by the Supreme Court indicates that the Government appears to be opposed to purchasing silver under the Pittman Act.

OLD METALS

Copper and brass scrap material held up firm at the month-end reflecting prevailing strength in market for new refined copper and trade confidence in the stability of prices. Demand has been good, and a large tonnage has changed hands lately. Active export demand was also a sustaining factor. The improvement was more noticeable in the latter part of the month. Lead grades were quiet, and demand limited. New York dealers quote the following buying basis: Crucible copper 15c to 15¼c, light copper 12¼c to 12½c, new brass chippings 11c to 11¼c, heavy brass 8c to 8¼c, heavy lead 4½c to 5c, old zinc 3c to 3¼c and aluminum clippings 17¼c to 18c.

Daily Metal Prices for the Month of July, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4*	5	8	9	10	11	12	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	18.125	18.125	18.125	.....	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	.....	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. N. Y.)	17.375	17.375	17.375	.....	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.70	6.70	6.70	.....	6.70	6.70	6.70	6.675	6.675	6.675	6.675	6.675	6.80
Brass Special	6.80	6.80	6.80	.....	6.80	6.80	6.80	6.775	6.775	6.775	6.775	6.775	6.90
Tin (f. o. b. N. Y.) c/lb. Duty Free.													
Straits	44.70	44.70	45.125	.....	45.125	45.125	45.125	45.625	45.875	45.875	46.75	47.375	46.875
Pig 99%	44.25	44.125	44.50	.....	44.625	44.50	44.50	45.125	45.375	45.375	46.25	46.875	46.45
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.80	6.80	6.80	.....	6.75	6.75	6.70	6.55	6.55	6.55	6.55	6.55	6.55
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	.....	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	.....	35	35	35	35	35	35	35	35	35
Shot	36	36	36	.....	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	.....	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.70	8.625	8.50	.....	8.50	8.25	8.25	8.35	8.35	8.25	8.25	8.25	8.25
Silver ¢/oz. Troy Duty Free	51.875	51.875	51.875	.....	51.875	52.25	52.00	52.125	52.125	52.375	52.875	52.625	52.50
Platinum $/oz. Troy Duty Free	64	64	64	.....	64	64	64	64	64	64	64	64	64

	18	19	22	23	24	25	26	29	30	31	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. N. Y.)	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.675	6.744
Brass Special	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.775	6.844
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	46.625	47.50	47.375	47.375	47.50	47.125	47.25	47.25	47.375	47.25	47.50	44.70	46.405
Pig 99%	46.125	47.00	46.875	46.875	47.00	46.625	46.75	46.75	47.00	46.875	47.00	44.125	45.901
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.80	6.55	6.609
Aluminum c/lb Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch. c/lb. Duty 2c/lb.	8.25	8.25	8.75	8.625	8.625	8.625	8.625	8.625	8.625	8.625	8.75	8.25	8.461
Silver c/oz. Troy Duty Free	53.25	53.50	52.625	53.00	52.625	52.625	52.875	52.625	52.50	52.625	53.50	51.875	52.483
Platinum $/oz. Troy Duty Free	64	64	64	64	64	64	64	64	64	64	64	64	64

*Holiday.

Metal Prices, August 5, 1929

NEW METALS

Copper: Lake 18.125. Electrolytic 18.00. Casting, 17.50.
Zinc: Prime Western, 6.75. Brass Special, 6.85.
Tin: Straits, 47.375. Pig, 99%, 47.00.
Lead: 6.55. **Aluminum,** 24.30. **Antimony,** 8.625.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $123.50. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 52.625.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $64.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¾to14
Brass Ingots, Red	15¾to16¾
Bronze Ingots	16¾to20
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	27 to39
Manganese Bronze Ingots	15 to20
Manganese Bronze Forging	35 to43
Manganese Copper, 30%	30 to40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	19 to22
Phosphor Copper, guaranteed 15%	21 to24
Phosphor Copper, guaranteed 10%	20 to23
Phosphor Tin, no guarantee	55 to70
Silicon Copper, 10%, according to quantity	30 to35

OLD METALS

Buying Prices		Selling Prices
15⅜to15½	Heavy Cut Copper	16⅜to16½
14⅛to14⅝	Copper Wire, mixed	15⅛to15⅝
12½to13½	Light Copper	13½to14½
12 to12½	Heavy Machine Composition	13 to13½
8¼to 9	Heavy Brass	9¼to10
7 to 7½	Light Brass	8 to 8½
9½to10	No. 1 Rod Brass Turnings	10½to11
11¼to11¾	Composition Turnings	12¼to12¾
5⅜to 5⅝	Heavy Lead	6⅛to 6⅜
3¼to 3¾	Zinc Scrap	4¼to 4¾
8 to 8½	Scrap Aluminum Turnings	12 to12½
11½to12	Scrap Aluminum, cast alloyed	15½to16
17 to18	Scrap Aluminum sheet (new)	20 to21
31 to33	No. 1 Pewter	36 to39
20 to21	Old Nickel Anodes	22 to23
20 to23	Old Nickel	22 to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....27¾c. to 28¾c. net base
From Stock .....28¾c. to 29¾c. net base

BARE COPPER WIRE

19⅝c. to 19⅞c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order .....26¼c. net base
100 lbs. to 200 lbs. in one order .....26¾c. net base

ZINC SHEET

Duty sheet, 2c., per pound — Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount .....10.25 net base
Casks, jobbers' price .....10.50 net base
Open casks, jobbers' price .....11to11.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 gr., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods.....	53c.	Cold Rolled Sheet.....	60c.
Hot Rolled Rods.....	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 54.625c. to 56.625c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.23¼	$0.25	$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30⅞	....	.35⅞
Open seam tubing	.31¼	....	.34¼
Angles and channels	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	24c. net base
Muntz or Yellow Rectangular sheet other Sheathing	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality.....	31⅜c.	10% Quality.....	34⅛c.
15% Quality.....	33c.	15% Quality.....	37¾c.
18% Quality.....	34¼c.	18% Quality.....	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, August 5, 1929

ANODES

Copper: Cast	28c.	per lb.
Rolled, oval	27c.	per lb.
Rolled, sheets, trimmed	27¾c.	per lb.
Brass: Cast	27c.	per lb.
Zinc: Cast	12½c.	per lb.
Nickel: 90-92%	45c.	per lb.
95-97%	47c.	per lb.
99%	49c.	per lb.

Silver: Rolled silver anodes .999 fine are quoted from 55½c., to 57½c., Troy ounce, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$27.06to$29.00
14" 20 ply 64/68 Unbleached	35.59to 37.65
12" 20 ply 80/92 Unbleached	30.70to 34.16
14" 20 ply 80/92 Unbleached	41.60to 46.09
12" 20 ply 84/92 Unbleached	36.00to 42.90
14" 20 ply 84/92 Unbleached	48.80to 57.60
12" 20 ply 80/84 Unbleached	38.35to 39.37
14" 20 ply 80/84 Unbleached	52.00to 53.12

Sewed Pieced Buffs, per lb., bleached .40c. to 73c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.14-.19
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.20½-.21
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.16¾-.21¼
Denatured, drums	gal.	.49-.59
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	3.3
Aluminum chloride, solution in carboys	lb.	.06½
Aluminum—Sulphate, tech., bbls.	lb.	.33
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.30
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.21½
Cyanide (100 lb. kgs)	lb.	.45
Sulphate, bbls.	lb.	6.7
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.13
Salts, double, 425 lb. bbls.	lb.	.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	42½
Cyanide (fluctuating)	oz.	.54-.56
Nitrate, 100 ounce lots	oz.	.36½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.37
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½